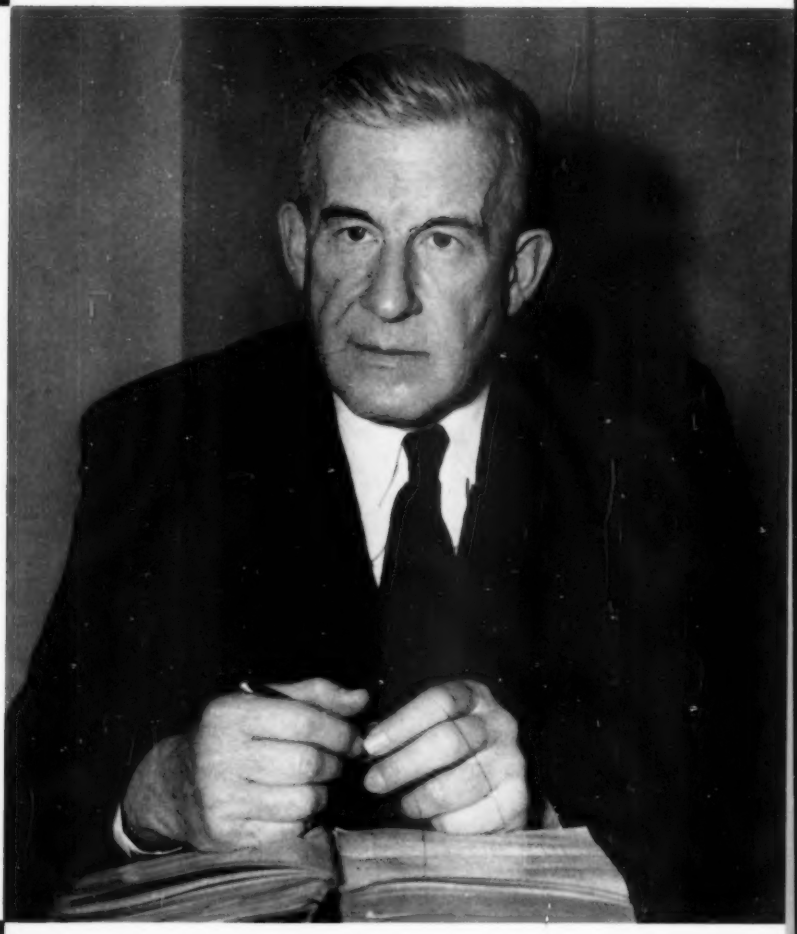
ORDNANCE

land ☆ sea ☆ air

Reg. U. S. Pat. Off.

VOLUME XXXVII NO. 198 MAY-JUNE 1953



ROBERT C. WATSON
United States
Commissioner of Patents

IN THIS ISSUE

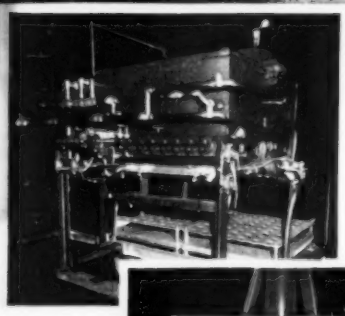
The Defense of Europe . . . . Gen. Alfred M. Gruenther

Canadian Preparedness . . . . . R. M. Brophy

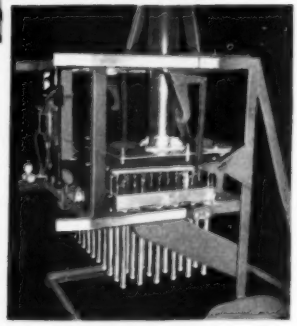
Command vs. Staff . . . . . Lieut. Gen. George H. Brett

Field Service with the Troops . . . . Mark S. Watson

Thunderjets Firing Triplex Loaded "Super Brisance" Rockets



Volumetric Pouring Unit



Silvertip Probe

Denser - Safer - Cleaner

POURING—3½ Million 105s—A Skid A Minute—On ONE Load Line—Without A Single Repair or Replacement.

PROBING—Triplex" Silvertip" Probes Transmit More B.T.U.s Per Second on Less Steam. The Industry's Fastest and Safest—Unconditionally Guaranteed!

ASSEMBLING—Crimpers, Powder Bag Inserters, Jumble Fixtures, Funnels, Concentricity Gauges, Washout Units, Carton Inserting and Taping Machines, Drilling and Facing, Punches and Dies, Angel Buggies, Explosive Handling Trucks, Demil and Rehab, Complete Round Assembly, Etc., Etc.

TRIPLEX

"Pass the Ammunition"

TRIPLEX INDUSTRIES INC., CHICAGO 27, ILL. • PHONE RIVERDALE 2200

WRITE, WIRE, OR PHONE • FRANK A. HINGER • DESIGNERS AND BUILDERS • HIGH EXPLOSIVE SPECIALISTS

Founded 1920

ORDNANCE

☆ LAND
☆ SEA
☆ AIR

The Magazine of Scientific and Industrial Preparedness

Vol. XXXVII MAY-JUNE 1953 No. 198

FEATURES

Robert C. Watson . . . . . **Front cover**
Exclusive photograph for ORDNANCE *by Harris & Ewing*

The Face of War . . . . . **Frontispiece**

The American Patent System 913
Sound basis of freedom and national defense

Command vs. Staff . . . . . **Lieut. Gen. George H. Brett** 914
Staffs should advise; commanders should command

Canadian Military Procurement . . . . . **R. M. Brophy** 917
Civilian agency negotiates all defense contracts

The Defense of Europe . . . . . **Gen. Alfred M. Gruenther** 922
Status of the North Atlantic Treaty Organization today

The Skysweeper 925
Automatic artillery weapon challenges jet planes

Continuing Preparedness . . . . . **R. J. Emmert** 929
How to preserve defense facilities for future emergencies

The Ordnance Training Command . . **Everett C. Schroder, Jr.** 934
Unique system develops skilled technicians

The James L. Walsh Prize Essay Contest 937
Announcement of the $1,000 competition for A.O.A. members

Field Service with the Troops . . . . . **Mark S. Watson** 938
Ordnance strives for "Service to the line, on the line"

Month by Month 945
Highlights of the national defense

Artillery Ammunition 947
An editorial on the strategic and tactical concepts of a complex problem

New Assault Transport 948
Photographs of the Lockheed C-130 turboprop aërial freighter

Industrial Preparedness 949
The bulletin on the progress of A.O.A. Technical Divisions and Committees

Chairmen of A.O.A. Technical Divisions and Committees . . . 958
Photographs of the Association's advisory group leaders

DEPARTMENTS

Atomic Energy 906
Association Affairs . . . 953
New Developments . . . 960
From the Record 972
Book Reviews 978
Index of Advertisements . . 1063

ARMAMENT TECHNOLOGY

Money and Rubber . . . . . **Bernard Quinn** 1049
Both are saved at Ober-Ramstadt tire rebuild shop

Defeating Corrosion . . . . . **A. R. Black and A. Wachter** 1052
Vapor phase inhibitors provide easy means of protecting steel from rust

Psychology Goes to War . . . . . **Ernest Conine** 1055
As a support weapon it can save both time and lives

New Ordnance Paints . . . . . **Dr. C. F. Pickett** 1060
Recent developments in lacquers for good surface preservation

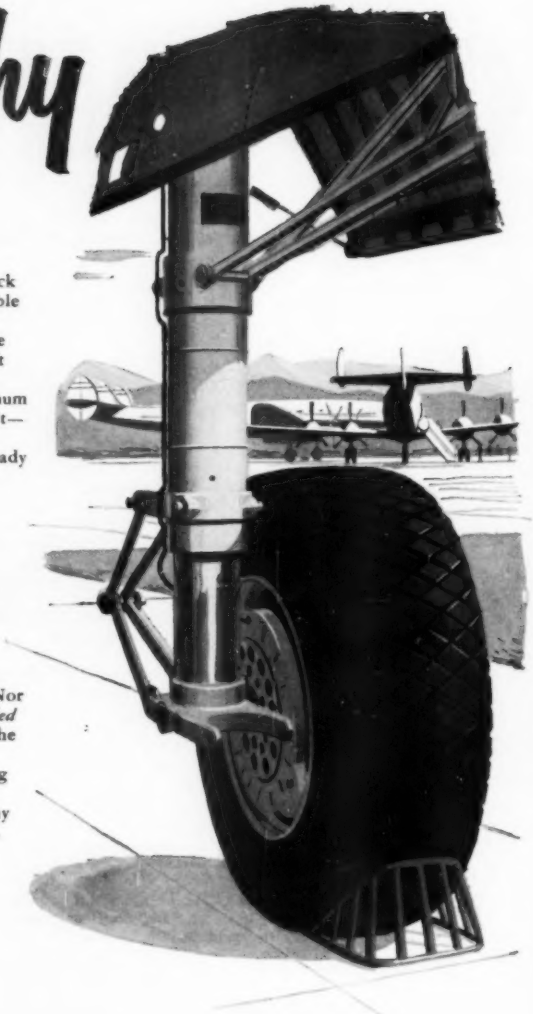
ORDNANCE is published bimonthly by the American Ordnance Association, 705 Mills Building, Washington 6, D. C. Entered as second-class matter, August 14, 1920, at the Post Office at Washington, D. C., under the Act of March 3, 1879. Additional second-class entry at the Post Office at Richmond, Va. Subscription rate: Continental U. S. and possessions, $4.50 annually, in advance; foreign, $6.00. Copyright 1953 by the American Ordnance Association. Title registered United States Patent Office. Six weeks' notice before next publication date required for change of address. ORDNANCE is combined with FIREPOWER and LOGISTICS, formerly published by the American Ordnance Association. *Editor:* Leo A. Codd. *Managing Editor:* R. E. Lewis. *Editorial Staff:* M. L. Van Horn, J. J. O'Connor, F. W. Foster Gleason, R. K. Smith. *Staff Assistants:* C. C. Alexander, G. C. Anderson, P. Cooke, G. M. Crump, L. F. Del Grosso, F. G. Ferriter, M. E. Ferriter, K. C. Hankey, B. M. Rounds, M. P. Saccoccia, M. J. Webb, N. A. Woodhouse. *Advertising representative:* Thomas O. Woolf & Son, 70 E. Forty-fifth Street, New York 17, N. Y. Advertising rates and publication schedule on request.

Aluminum is *Why*

Single press stroke saves $10.00 worth of machining

Hogging this landing gear plunger out of bar stock wasted half the aluminum in chips—tied up valuable machine capacity—squandered costly man-hours.

Because even tough aluminum aircraft alloys are ductile and formable, Alcoa engineers and aircraft designers saw the savings possible by impact extruding this part. Today, a slug of tough aluminum alloy is placed in a shallow die—a punch strikes it—the aluminum squirts upward, faster than the eye can follow. Almost instantaneously a plunger is ready for finish machining and assembly—a saving of $10.00 per part.



ALCOA is *How*

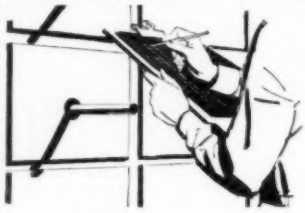
Though impact extruding is not new, it has been confined to simple, cup-shaped parts of workable alloys. But here, a *tough* alloy has been extruded. Nor is the shape simple. It is *thick bottomed, heavy walled* and the open end is flared, all an integral part of the extruding process. Impact extrusions, as Alcoa makes them, compete with almost every fabricating process. Let your local Alcoa Sales Engineer help you explore their possibilities. Aluminum Company of America, 850-E Alcoa Bldg., Pittsburgh 19, Pa.

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA

This strong, one-piece oil filter housing is an aluminum impact extrusion, produced by Alcoa in a single press operation. Formerly, this part required several operations.

Fabricating this double-wall fuse cap formerly involved an expensive welding operation. Now it is impact extruded by a single press stroke at Alcoa's Edgewater plant.



Used in electronic work, this impact-extruded can demonstrates an extreme length-to-diameter ratio which goes far beyond limits formerly believed possible.

HOW WOULD YOU

MACHINE THE ENDS OF THESE
3 RECTANGULAR HOLES, AT AN ANGLE,
IN THIS
COMMANDER'S CUPOLA
forged of ARMOR STEEL

it's easy and accurate
with **LAPOINTE BROACHING!**

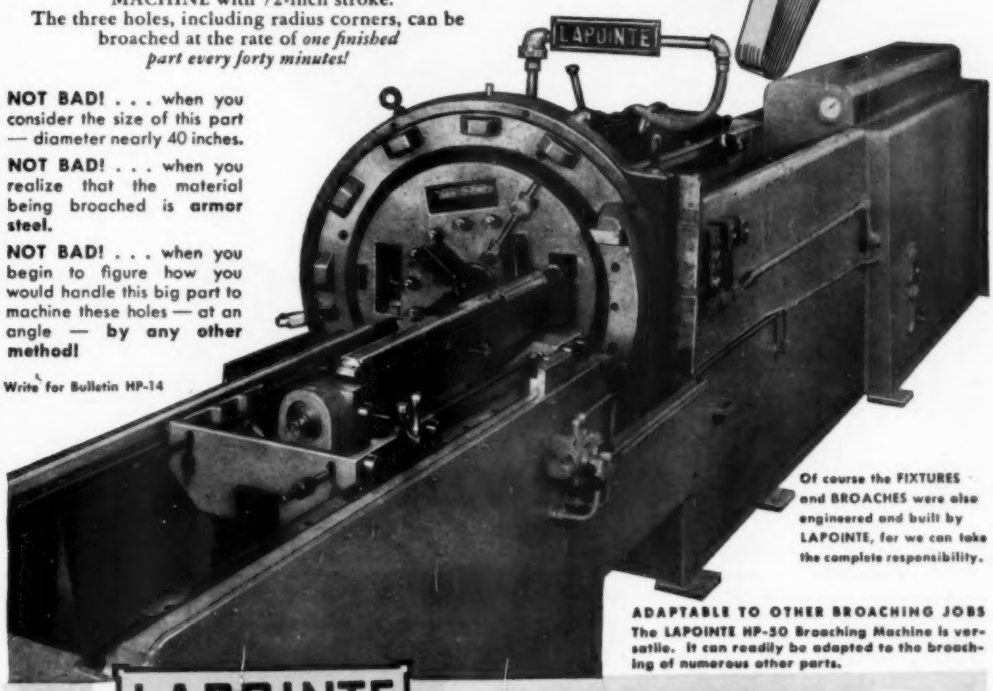
The best way to do it is to use this rigid 25-ton LAPOINTE HP-50 Horizontal BROACHING MACHINE with 72-inch stroke. The three holes, including radius corners, can be broached at the rate of *one finished part every forty minutes!*

NOT BAD! . . . when you consider the size of this part — diameter nearly 40 inches.

NOT BAD! . . . when you realize that the material being broached is **armor steel.**

NOT BAD! . . . when you begin to figure how you would handle this big part to machine these holes — at an angle — **by any other method!**

Write for Bulletin HP-14

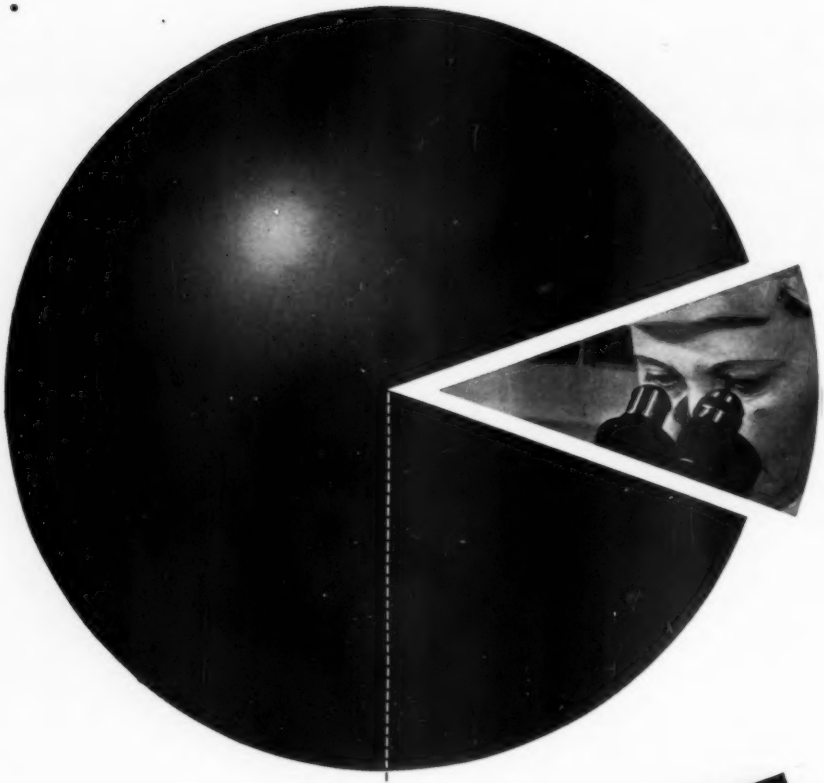


Of course the FIXTURES and BROACHES were also engineered and built by LAPOINTE, for we can take the complete responsibility.

ADAPTABLE TO OTHER BROACHING JOBS
The LAPOINTE HP-50 Broaching Machine is versatile. It can readily be adapted to the broaching of numerous other parts.

THE LAPOINTE MACHINE TOOL COMPANY
HUDSON, MASSACHUSETTS • U. S. A.
Branch Factory: Watford, Herts., England

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



Typical of the careful inspection which New Departure bearing parts must undergo, a raceway is checked by powerful microscope which could reveal the most minute flaw.

New Departure ball bearings are readily available at your equipment dealer or bearing distributor—supplied from the industry's largest nation-wide network of warehouse stocks.

ACCURATE
TO THE ND DEGREE

Today's machines . . . automobiles or aircraft . . . conveyors or combines . . . recording instruments or radar installations . . . require accurate, low friction support for their moving parts. Where ball bearings are best for this job, the *best ball bearings* are New Departures, because of the highest quality standards in the industry.

For many New Departure bearings the diameter and roundness of the balls are held within the limits of a few millionths of an inch. And other parts of the bearings . . . rings, races, separators and seals . . . must pass batteries of scientific inspection devices and skilled operators, before and after assembly.

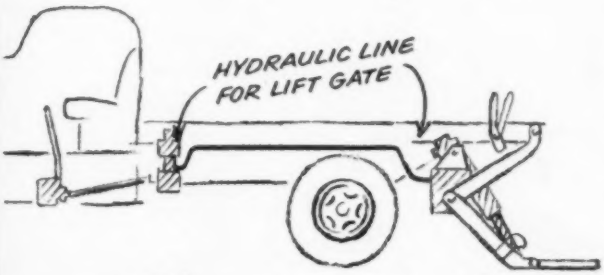
If an application calls for ball bearings of pre-determined accuracy and life expectancy, install New Departures. Keep your eye on the BALL to be sure of your BEARINGS!

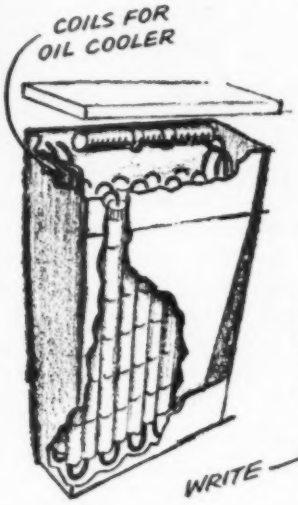
NOTHING ROLLS LIKE A BALL

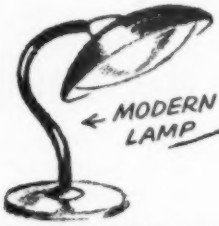
NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT
Also Makers of the Famous New Departure Coaster Brake

FROM *the Bundy Sketchbook*
TO *jog a designer's imagination*







REMARKS Need tubing that will do a better job for you? Look into Bundyweld. Need fabricated tubing parts? Let us tell you about Bundy's unmatched facilities. Need engineering help? Let us show you what we can do.

WRITE → today for catalog or for help in developing your idea for a tubing application.

BUNDY TUBING CO., DETROIT 14, MICH.

Bundyweld Tubing

® DOUBLE-WALLED FROM A SINGLE STRIP

Leakproof
High thermal conductivity
High bursting point
High endurance limit
Extra-strong
Shock-resistant
Ductile

Lightweight
Machines easily
Takes plastic coating
Scale-free
Bright and clean
No inside bead
Uniform I.D., O.D.

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of copper-coated steel. Then it's . . .

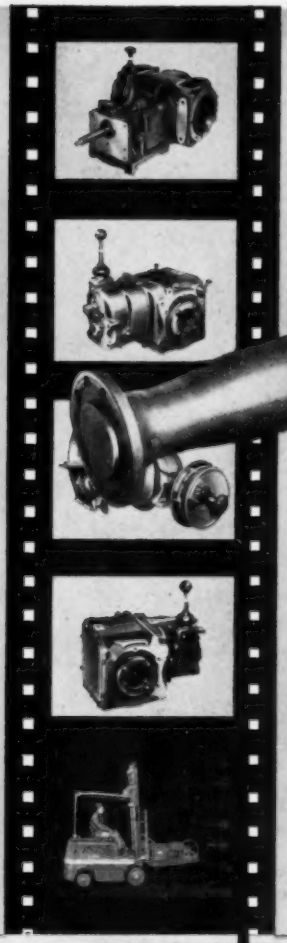
continuously rolled twice around laterally into a tube of uniform thickness, and

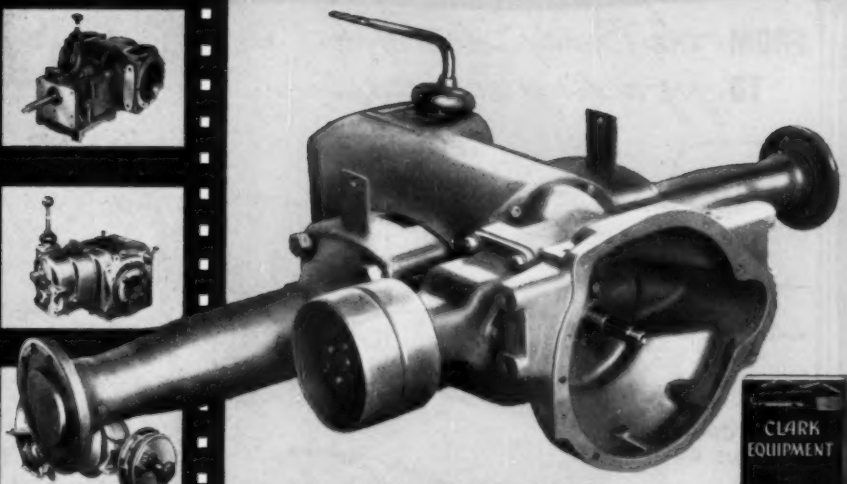
passed through a furnace. Copper coating fuses with steel. Result . . .

Bundyweld, double-walled and brazed through 360° of wall contact.

← **NOTE** the exclusive patented Bundyweld beveled edges, which afford a smoother joint, absence of bead and less chance for any leakage.

Bundy Tubing Distributors and Representatives: Cambridge 42, Mass.: Austin-Hastings Co., Inc., 226 Binney St. • **Chattanooga 2, Tenn.:** Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • **Chicago 32, Ill.:** Lapham-Hickey Co., 3333 W. 47th Place • **Elizabeth, New Jersey:** A. B. Murray Co., Inc., Post Office Box 476 • **Philadelphia 3, Penn.:** Rutan & Co., 1717 Sansom St. • **San Francisco 10, Calif.:** Pacific Metals Co., Ltd., 3100 19th St. • **Seattle 4, Wash.:** Eagle Metals Co., 4755 First Ave. South **Toronto 5, Ontario, Canada:** Alloy Metal Sales, Ltd., 181 Fleet St., E. • **Bundyweld nickel and Monel tubing is sold by distributors of nickel and nickel alloys in principal cities.**

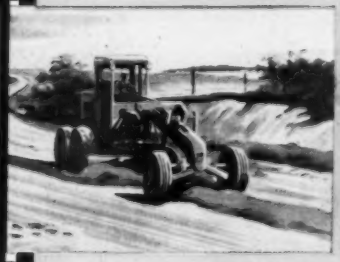




PRODUCTS OF CLARK
• send for copy of the NEW Booklet

dependability

If there's any one word that typifies CLARK Drive Units it's "Dependability" . . . the year-in-and-out assurance of smooth, efficient performance even under the most punishing conditions. They're designed specifically for the job . . . soundly engineered . . . built to exacting standards . . . and backed by 50 years of experience. You might find this a good reason to follow the lead of the many manufacturers of heavy duty automotive, farm and industrial equipment who say, "it's good business to do business with CLARK."



1903 1953
FIRST FIFTY YEARS
CLARK EQUIPMENT

CLARK EQUIPMENT COMPANY

BUCHANAN, MICHIGAN

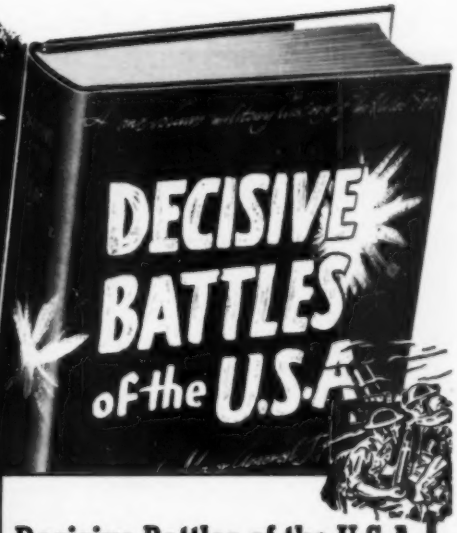
Other Plants: BATTLE CREEK *and* JACKSON, MICHIGAN

PRODUCTS OF CLARK — TRANSMISSIONS • AXLES • AXLE HOUSINGS • TRACTOR DRIVE UNITS • FORK TRUCKS AND TRACTORS • POWERED HAND TRUCKS • GEARS AND FORGINGS • ELECTRIC STEEL CASTINGS

Free this great book

when you join the new

MILITARY SCIENCE BOOK CLUB



Decisive Battles of the U.S.A.

By Major-General J. F. C. FULLER

Out of print for years, this famous classic has now been reprinted for members of the Military Science Book Club. An internationally known strategist gives an absorbing account of each of the 22 battles that affected American history from the Battle of Trenton to the Meuse-Argonne. The strategy of opposing armies is skillfully analyzed and each battle's historical consequences clearly traced. Brilliant synopses of each campaign and the intervening peace periods make this actually an indispensable military history of the United States. *Illustrated with 29 maps and battle plans.*

Retail price $6.50

FREE to new members

Benefits You Enjoy as a Member

THE MILITARY SCIENCE BOOK CLUB was formed to make available, (often at savings up to 40% or more), the important books dealing with the world's most significant military operations of the past and present.

These books, by leading military and naval authorities, cover every branch of the services. They include works which describe, with first-hand clarity, the background data, the elements of arms and logistics, the brilliant strategy which affected the decisions and plans that have shaped world history throughout the ages.

They also include intimate biographies of the great generals and admirals who have had the greatest influence on international affairs. These are the books for which successful military men have always reserved a share of their reading time, in order to broaden their fields of vision and draw valuable analogies for future guidance.

Members have the advantage of being able to acquire, at moderate cost, superb and constantly growing libraries of the finest books which have been or will be written in this particular field.

Each month the Club's editors will select an outstanding book. This and other significant works in the same field will be described in the Club *Review* which you receive *free*.

On joining, you receive DECISIVE BATTLES OF THE U. S. A. *free* with your first selection, THE MARSHALL STORY. For every four additional selections you accept, you receive a FREE Bonus Book.

You will not have to accept every selection — as few as four a year fulfills your sole membership obligation. You accept *only* the books you want, and pay the member's special reduced price, plus small fixed mailing charge, *after* receiving them. If you do not want a forthcoming selection, you simply return a printed form which is always supplied.

It costs nothing to join and you may cancel your membership at any time after accepting four selections. Send no money. Just mail coupon *today*.

Since the dawn of history, great military leaders have been ardent students of military science and tactics. Alexander, Caesar, Napoleon, Nelson, Washington, Lee, Grant, Pershing, Marshall, Eisenhower, Halsey, King, and all the others you could name — have been guided and influenced by military history — have kept themselves informed by intelligent reading.

GET $11.50 WORTH OF BOOKS FOR ONLY $4.00 — JOIN NOW!

This coupon makes you a member with all privileges

MILITARY SCIENCE BOOK CLUB, Inc.
Dept. OR, 11 E. 36th St., New York 16, N. Y.

Please enroll me as a member and ship me immediately DECISIVE BATTLES OF THE U. S. A. as my FREE membership gift, along with my first selection, THE MARSHALL STORY, at the member's special reduced price of $4.00 plus 30c for postage and packing. I am to receive the *Military Science Book Club Review* FREE every month, and a FREE Bonus Book for each four additional selections I accept. I agree to accept as few as four selections during my first year of membership.

Name .....

Address .....

City ..... Zone ..... State .....

Start your membership with

The Marshall Story

A Biography of Gen. George C. Marshall

By ROBERT PAYNE

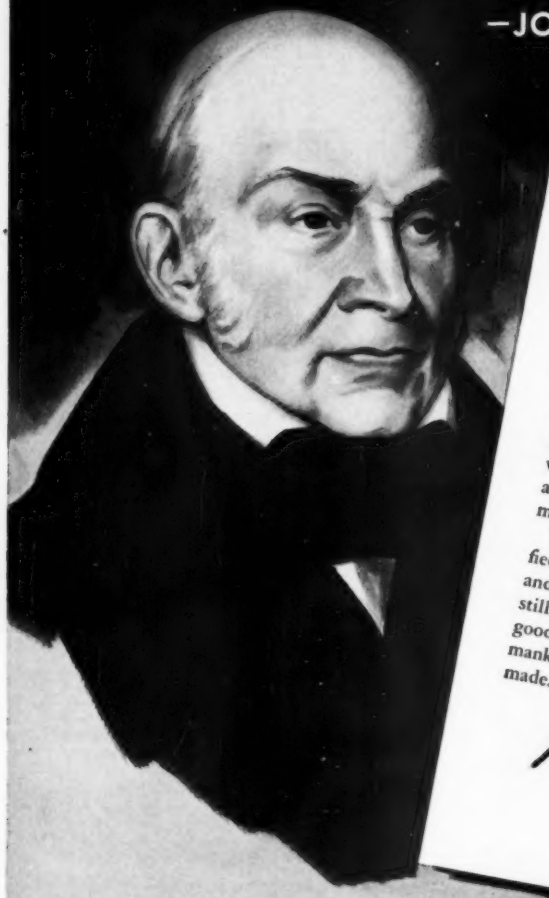
A provocative study of "the greatest Chief of Staff this country has ever had . . . a man who was oppressed by war and yet strove to bring himself to a pitch of mechanical perfection in the art of war . . . and who knows more about war than anybody else in his generation."

Retail price $5.00 ***To members, only $4.00***

Guide words for today—

Posterity! You will never know how much it cost the present generation to preserve your freedom. I hope you will make good use of it.

—JOHN QUINCY ADAMS



The life span of America's 6th President—1767 to 1848—covered the turbulent years of the nation's birth, and the greatest tests of its determination to remain free. Adams fought slavery within the country, and as Secretary of State advocated the Monroe Doctrine. As well as any, he knew the great cost of preserving freedom.

His words might have been spoken by many Presidents in our history. Protecting our liberty is a continuing task to which every generation has contributed, and to which every future generation must be dedicated.

With clear understanding and a unified effort on the part of business, labor and government, future generations will still have the opportunity to "make good use" of freedom — under which mankind's greatest progress has been made.

PRESIDENT

DUTY HONOR COUNTRY
LABOR
BUSINESS
GOVERNMENT

The Gray Manufacturing Company, Hartford 1, Connecticut

Makers of Audograph and PhonAudograph Electronic Soundwriters

AND GRAY RESEARCH AND DEVELOPMENT CO., INC., Specialists in Video, Audio, Sub-Audio Electronic Mechanisms

Efficient Stripping of Rejected Painted Parts

When the volume of painting rejects slows down your rate of production—as may occur in the manufacture of rigorously-inspected defense equipment—it is time to plan an efficient method for stripping the faulty coatings.

The rejected parts represent a considerable investment in the cost of metal and the cost of fabrication. To hide 5% of your total production in a corner is like hiding 5% of your working capital in a sock. The quicker you reclaim those rejects and push them through as accepted parts, the better profit you make on your contract.

Sometimes the time element dictates more efficient stripping. Suppose that a sub-contractor undertakes to produce 100,000 parts in 20 days. Suppose also that he averages 5% rejects and that he lets them pile up until he has 5,000 to strip and re-process on the 20th day.

On that day he discovers with sorrow that it is a lot harder to strip and repaint 5,000 rejected parts than it was to paint his regular daily quota of 5,000 new parts. He misses his deadline and suffers embarrassment that could have been avoided by stripping 250 rejects each day for 20 days instead of 5,000 in one day.

Furthermore, it usually is much easier to strip the parts on the day they are rejected. Even though the parts were thoroughly baked in the ovens, it is still true that the longer the paint ages on the metal the harder it is to remove by any method of stripping.

Another point is that the easy method of dumping the rejects into an out-of-the-way tank for overnight soaking frequently is not the best way to strip the paint. Some paints cannot be removed by immersion in any one stripper, be it alkaline or acid or solvent. Yet many such paints respond quite readily to the right combination of two of these strippers.

The technique of rinsing is also important. Some paints yield only to a hot alkaline stripper followed by a hot rinse. Sometimes a cold rinse following a hot immersion seems to provide a shock that removes the paint with great speed.

The economy of finding the best stripping method is so great that it merits careful planning. It may also require the advice of a man who has had plenty of experience with all types of stripping operations. Such a man is the Oakite Technical Service Representative in your city.

The Oakite Representative has a broad array of stripping materials at his command:

- Oakite Stripper, Oakite Stripper M-3, Oakite Stripper R-6, Oakite Composition No. 45 and Oakite Composition No. 60 are alkaline materials that work with great speed and efficiency, whether used for reclaiming rejects from the painting line or for stripping conveyor chains, racks and hooks. These materials also are excellent for "killing" the oversprayed paint in water-wash booths.
- Oakite Test X is another alkaline material capable of removing many types of paint.
- Oakite Composition No. 17 (solvent) and Oakite Composition No. 64 (alkaline) are especially designed for safe stripping of zinc chromate primer from aluminum.
- Oakite Composition No. 15, Oakite Composition No. 15A, Oakite Composition No. 18 and Oakite Composition No. 56 are solvent strippers of great effectiveness, particularly on the newer types of synthetic enamels.
- Oakite Composition No. 57 is a viscous solvent stripper that has special value for its ability to adhere to vertical and inverted surfaces.
- Oakite Compound No. 33 is an acidic material that simultaneously removes oil and rust in addition to stripping certain types of organic finishes.

For more information on this subject, phone your local Oakite Technical Service Representative or mail the coupon at the right.

Advertisement

DO REJECTS SLOW UP YOUR PRODUCTION LINE?

OAKITE PAINT STRIPPERS MAY HELP YOU BREAK THE BOTTLE'S NECK

When the volume of painting rejects slows down your rate of production—you may need one of the stripping materials described in Oakite's free booklet "How to STRIP PAINT." This compact illustrated booklet answers many questions that will help you work out better stripping procedures. As a metal processor you will be particularly interested in:

- **What's the best way to strip paint from metal parts too large to be soaked in tanks?** *See page 3.*
- **What is the cheapest way to strip metal parts in large volume?** *See page 9.*
- **What are the best ways to prepare stripped surfaces for repainting?** *See page 11.*
- **What strippers are best for removing oil-base paints?... Synthetic enamels, alkali-resistant plastics or resin-based paints?... Japans, wrinkle finishes, nitrocellulose lacquers, alkyds, phenolics and ureas?** *See page 12.*

FREE For a copy of "*How to STRIP PAINT*" and for advice on your particular paint-stripping problem, just send us the coupon.

Technical Service Representatives Located in Principal Cities of United States and Canada

SPECIALIZED INDUSTRIAL CLEANING
OAKITE
MATERIALS · METHODS · SERVICE

OAKITE PRODUCTS, INC.
14F Rector Street, New York 6, N. Y.

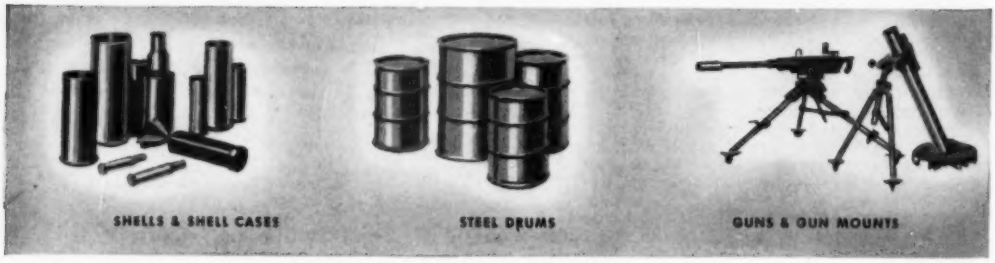
Send me a FREE copy of your booklet "*How to STRIP PAINT.*" Also, tell me about your methods for removing the following organic finishes:

Name

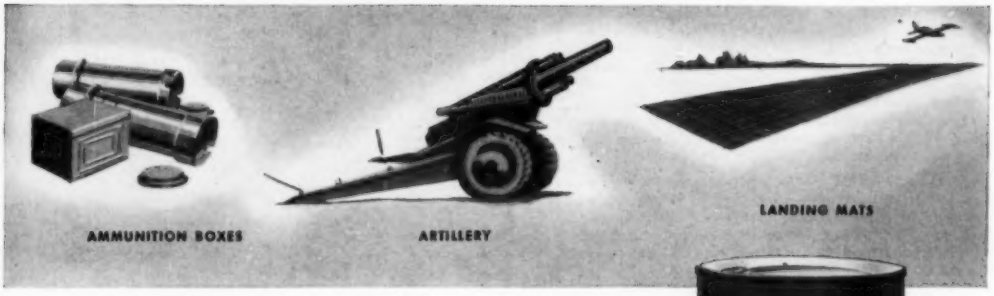
Company

Address

Fitted to every military need—



Glidden Specification Finishes



When it comes to supplying specification finishes, The Glidden Company has the background of experience . . . the extensive laboratory and production facilities . . . and the field service follow-through to meet every requirement. Specify Glidden quick-drying enamels, primers, lacquers, or temporary strip coatings. You are assured of the highest quality in finishes "custom-tailored" to your facilities. Write today for detailed specifications.

THE GLIDDEN COMPANY
NATIONAL DEFENSE DEPARTMENT
11005 Madison Avenue ★ Cleveland 2, Ohio

SALES OFFICES AND FACTORIES: San Francisco, Chicago (Nubian Division—1855 North Leclaire Avenue), Minneapolis, New Orleans, St. Louis, Cleveland and Reading

Pipes that grew without getting bigger

Cross-section of coaxial cable. To triple capacity, Bell Laboratories and Western Electric engineers had to make 1000 amplifiers work perfectly in tandem . . . feed repeater power along the same cable that carries messages . . . put signals on and off the line at numerous cities along the route without distortion.

Pencil-size pipes carry telephone messages and television across country through the Bell System's coaxial cable. Once, each pipe could carry 600 voices, or one television program. Now it can carry 1800 voices, or 600 voices *plus* a broadcast quality television program.

Yet the pipes aren't any larger. They are being made into triple-duty voiceways by new repeaters, new terminal equipment and other transmission advances developed by Bell Laboratories engineers.

The conversion expense is less than the cost of laying extra coaxial cables. But it calls for highly refined manufacturing procedures, made possible only by close co-operation of Bell Laboratories and Western Electric, manufacturing unit of the Bell System.

In improving the coaxial cable system they created more than 20 years ago, engineers at Bell Telephone Laboratories devised a new way to give America still better telephone service, while the cost stays low.

Laboratories engineer tests new triple-duty coaxial system. It marks the first time that telephone conversations and television can travel through the same pipes at the same time. With a wider frequency band being transmitted, big problem was to eliminate interference between the two types of signals.

BELL TELEPHONE LABORATORIES

IMPROVING TELEPHONE SERVICE FOR AMERICA PROVIDES CAREERS FOR CREATIVE MEN IN SCIENTIFIC AND TECHNICAL FIELDS

ECLIPSE-PIONEER "KNOW-HOW" PAYS OFF ON ORDNANCE VEHICLES

Based on original development work by Eclipse-Pioneer, a 24-volt electrical system has been made standard on all vehicles designed for Army Ordnance.

This system pays off in three important ways. First, it *saves critical space* because it's much more compact than the old 6- and 12-volt systems of comparable ratings. Second, it's *more readily serviced* since its component parts are interchangeable with those on often-available 24-volt aircraft equipment. Third, it's *more versatile* since its design is waterproof in accord with Army standards for submerged operation.

It was quite natural that Eclipse-Pioneer should take the lead in developing and manufacturing this more efficient electrical equipment. It was quite natural because Eclipse-Pioneer is unique in possessing the necessary "know-how" and production facilities, having acquired them in developing similar equipment for the aviation industry.

Among items now being produced by Eclipse-Pioneer for Ordnance are DC Generators, Generator Control Boxes, Starters, and Starter Relays. And other precision products for Ordnance application are now in advanced stages of development.

ECLIPSE-PIONEER DIVISION OF
TETERBORO, N. J.

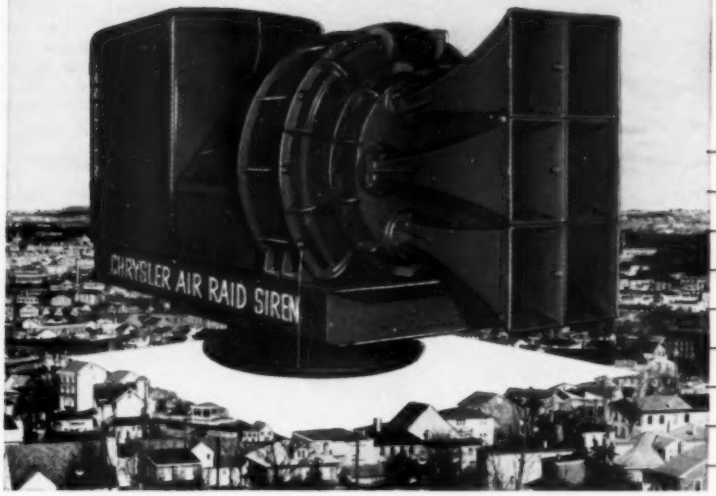
Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

Bendix
AVIATION CORPORATION

To alert any of these U. S. Cities would require NOT MORE THAN

5*

CHRYSLER SIRENS



- Altoona, Pa.
- Amarillo, Texas
- Augusta, Ga.
- Binghamton, N. Y.
- Charleston, S. C.
- Charleston, W. Va.
- Columbus, Ga.
- Davenport, Iowa
- Durham, N. C.
- Greensboro, N. C.
- Lawrence, Mass.
- Macon, Ga.
- New Britain, Conn.
- Portsmouth, Va.
- Pontiac, Mich.
- Portland, Me.
- Racine, Wisc.
- St. Joseph, Mo.
- Springfield, Ill.
- Springfield, Ohio
- Stockton, Calif.
- Topeka, Kans.
- Troy, N. Y.
- Wilkes-Barre, Pa.

According to the most recent official census figures, these twenty-four cities have populations ranging from 70,000 to 85,000. One of them has an area of twenty square miles, or about 3500 people per square mile, while another has only slightly more than five square miles with 13,760 people per square mile. But despite their apparently widespread differences, none of these cities would require more than five Chrysler Sirens. This number would give each of them good basic protection and a warning system second to none.

The Chrysler Siren is ideal for the small city as well as the large. First, because it has its own power plant, the Chrysler Siren can be operated from virtually any fixed or moving site. Second, the Chrysler Siren functions both automatically and manually, enabling combined utility remote-controlled operation with neighboring communities as well as individual, manual operation for purely local use. Finally, the 180 horsepower Chrysler V-8 Industrial Engine develops a terrific 400 miles per hour blast, sufficient to send the "loudest warning ever heard" four miles in every direction from the rotating siren.

No other warning device compares for power, for mobility and—because of its tremendous coverage—for economy. Help arrange a demonstration of the Chrysler Siren *in your community*, write: *Department 35, Siren Layout Service, Industrial Engine Division, Chrysler Corp., Trenton, Michigan.*

CHRYSLER AIR RAID SIREN

Defense is a vital need, shared by all. Join and assist the Civil Defense group in your area.

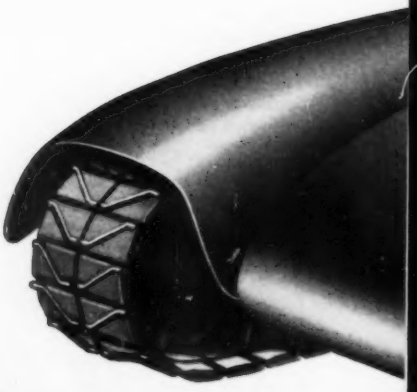
*Preliminary estimate based on proven performance of Chrysler Sirens in other cities and without consideration of topography or unusual noise factors.

This skeleton tank was produced in 1918. It was built with the view of securing a light vehicle capable of crossing wide trenches. Many structural members were pieces of iron pipe with plumbing connections. The skeleton tank was powered with two 4-cylinder water cooled engines having a combined horsepower of 100. The unit weighed 8 tons and had a maximum speed of 5 mph. The driver sat in the front and in the rear was a gunner manning a 0.30 caliber machine gun.

FROM THE SHAPE OF THINGS PAST

ARMOR PLATE — *for Ordnance*

Every production facility for armor plate, ready to assemble in gauges from 1/4" to 4" inclusive



Standard Steel Spring Company

ARMOR PLATE DIVISION • PENOBSCOT BLDG. • DETROIT, MICHIGAN

Standard Steel Spring Company

ALWAYS A GUIDING FORCE IN TANK PRODUCTION

Throughout the entire evolution of tank development Standard Steel Spring Company has lent a guiding hand in the design and production of a multitude of armored components. Today, our broad engineering and manufacturing experience is working at its highest skill producing a heavy tonnage of flat, formed, fully machined armor plate for tank fabricators. We tool these parts for their most economical production and work in the closest cooperation with procurement, production and inspection.

If you have a need for armor plate or are interested in a redesign program for greater efficiency and economy turn to us. You'll find that Standard Steel Spring Company—America's largest producer—is your best source for specially designed armor plate to meet your specialized individual needs.

Artist's conception of a long, low and streamlined tank of the future. The spherical contours of the armor plate minimize the effects of enemy fire power.

On the double...

Production lines have to move quickly..."on the double"...these days. And they have to be "double" in another way, too...they must produce for *both* industry and defense needs.

American Locomotive, for example, in a completely separate operation, makes the Army's mighty new medium tank. In other plants, top priority equipment for the Army, Navy, Air Force and Atomic Energy Commission is produced.

Simultaneously, Alco production lines are turning out modern diesel-electric locomotives and basic equipment essential to the rail, oil, power and chemical industries.

This "on-the-double" production is a necessity if we are to keep America's growing strength on a secure foundation.

AMERICAN LOCOMOTIVE COMPANY

producing both industrial and defense products

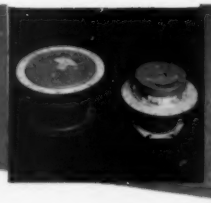
to get MORE PRODUCTION at LOWER COST with your PRESENT MANPOWER

the **Sheffield** corporation

Dayton 1, Ohio, U.S.A.

SHEFFIELD MASTER CRAFTSMAN HEADQUARTERS

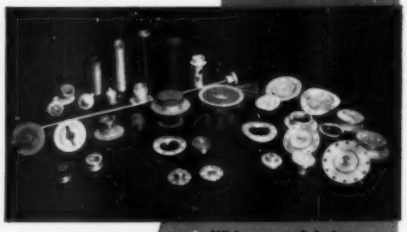
GAGES • MEASURING INSTRUMENTS • MACHINE TOOLS
CONTRACT SERVICES • THREADING TOOLS



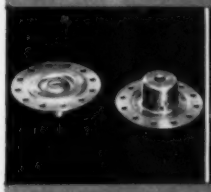
Safety cap and pop-pet valve assembly for pressure fueling system.

PRECISION *is Vital in Aircraft Filler Tubes and Caps*

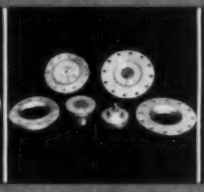
We make all of these aircraft components under *rigid precision requirements.* Tank pressures from 10 to 100 P.S.I. are greatly increased by flight maneuvers, especially on military planes. Shown here are caps, tubes, valves, adapters . . . for fuel, oil, coolant, water . . . single or multiple use . . . flush or non-flush installations.



Wide range of design in filler tubes and caps.



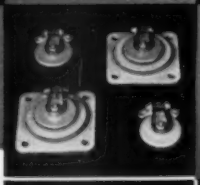
Flush-type fuel tank drain valve.



Type 3 — Flush-type filler cap and adapter.

Type 1, 2 inch — Filler cap and tube.

Filler caps for 15 P.S.I.



AF-approved fuel system check valve.

Type 2 — Filler cap and adapter assembly weighing 10 ozs.

We are superbly qualified and equipped for PRECISION production in contract manufacturing. Send us your problem with specifications. Or write today for our Production Facilities Book.

Filler unit for Air Force planes. Type 1, 2 inch — Filler cap and adapter assembly.

NAF 1152 series tested to exceed 10 P.S.I.

THE STEEL PRODUCTS ENGINEERING CO.

Research • Development • Engineering & Manufacturing • Springfield, Ohio

Smallest and Lightest!

AMP CAPITRON* HIGH VOLTAGE CAPACITORS AND PULSE FORMING NETWORKS

...with outstanding STABILITY and RELIABILITY for application in radar, missile control, and similar guided systems!

AMP CAPITRON* Capacitors and Pulse Forming Networks are particularly suited for radar and guided systems not only because of their remarkable size and weight characteristics, but also because of their outstanding stability and reliability in operation. AMP Pulse Forming Networks are fabricated with AMPLIFILM*, a startling new synthetic dielectric, chemically similar to mica, which imparts its unique combination of extremely high dielectric strength, stability over wide temperature ranges, low power factor, and good dielectric constant to these products. They are designed in each instance for the specific requirements as to size, shape, working or test voltage, capacitance, life or other operating conditions of the equipment in which they are to be used. Inquiries are invited.

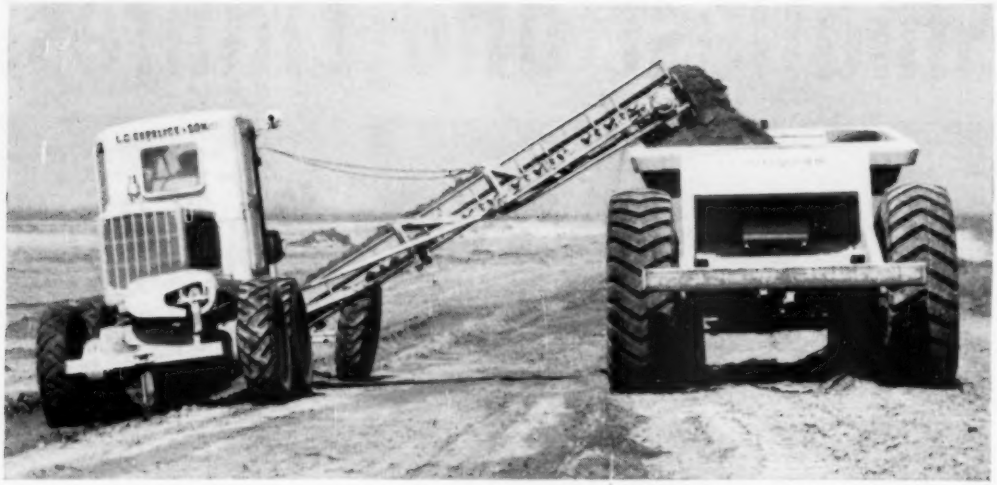
- up to 70% size and weight reduction
- wide temperature range
- close capacity tolerance
- no derating
- no drift
- highest known leakage resistance
- low absorption
- meets Jan-C-25 (3) specs.
- dimensional flexibility

AMP

AIRCRAFT-MARINE PRODUCTS, INC.
CHEMICALS AND DIELECTRICS DIVISION
2100 Paxton Street • Harrisburg, Pa.

AMP is also nationally recognized leader in the field of solderless terminals, simplified wiring devices and automatic wire termination. Write for our "Quality Control" brochure.

AMP Trade-Mark Reg. U.S. Pat. Off. *Trade-Mark



▲ **On a 4,500,000-yd. construction job** at Grumman Aircraft Plant, Calverton, L. I., N. Y., a Caterpillar No. 12 Motor Grader with Donor Elevating Grader feeds fill dirt into a W20 Wagon pulled by a DW20 Tractor. Contractor: L. G. DeFelice & Son, Inc., North Haven, Conn.

•

PROOF OF PERFORMANCE

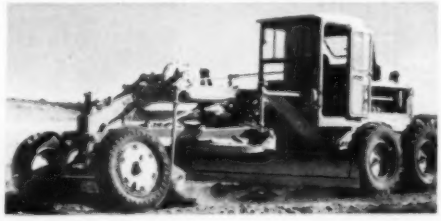
at bases and airports all over the country!

These are just a few of the many bases and airports all over the country on which Cat Diesel Motor Graders have worked or are now working. Another proof of their outstanding performance is this* fact: *99 per cent of all Cat Motor Graders ever built are still on the job—still saving money.*

Caterpillar Tractor Co., Peoria, Illinois

At Travis Air Force Base, Fairfield, California – a Cat No. 12 Motor Grader is working on construction of apron and ▼ taxiway. Contractor: Peter Kiewit Sons Co., Fairfield, Calif.

A steady worker for years, this Cat No. 12 Motor Grader is scarifying a runway at Borger Airport, Borger, Texas. ▼ Contractor: Smith & Robinson, Borger, Texas.

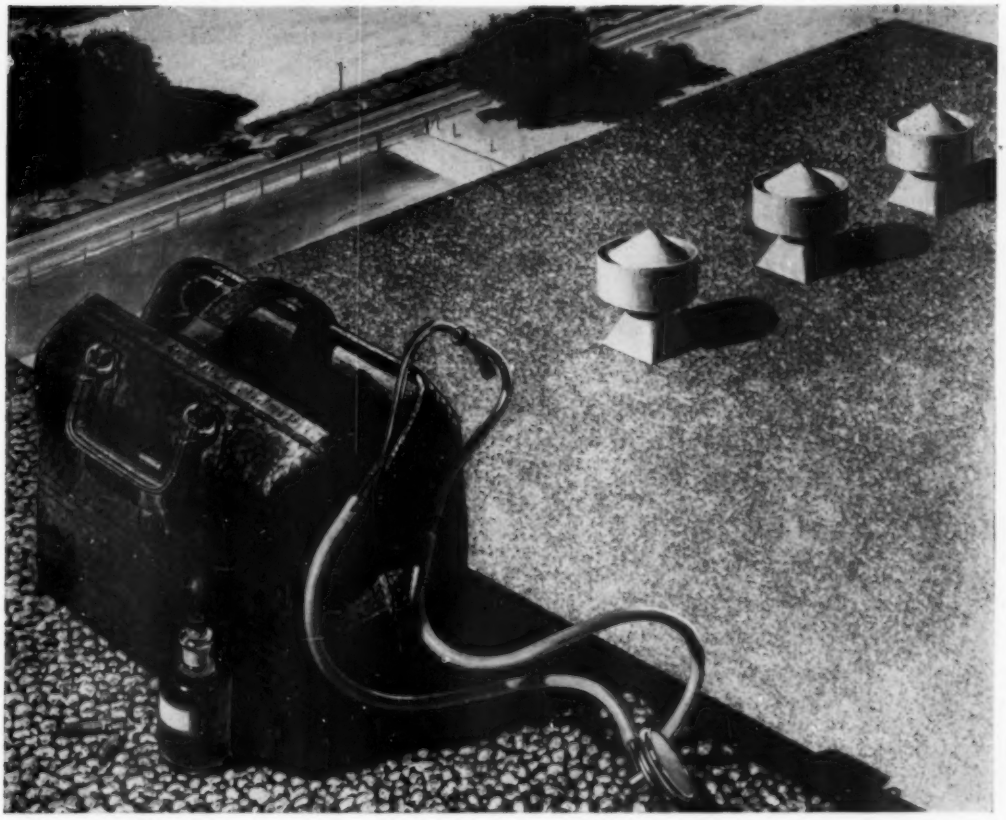


Speeding 3,000-ft. extension of runway for jet air base near Youngstown, Ohio – a Caterpillar No. 112 Motor Grader. ▼ Contractor: Allegheny Asphalt & Paving Co., Pittsburgh, Pa.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks – ®

NAME THE DATE... YOUR DEALER WILL DEMONSTRATE



Roof that "doctors" itself!

● Cracks from weathering have a nasty habit of cropping up on roofs. If these cracks are overlooked or neglected, they grow bigger — deeper — and the roof is headed for expensive repairs.

But there's no such worry with a Koppers Pitch and Felt Roof. When a crack appears on the roofing surface, it's not long before the pitch starts to flow into the fissure . . . "doctors" the injured area by gradually filling it up and sealing it.

Besides being self-healing, Koppers Roofs have many other properties that result in long-life roofing. Take water-resistance, for example. Many Koppers Roofs are water-cooled; even though water completely covers these roofs, they still protect buildings and their contents effectively.

Koppers has confidence in its roofs —best proved by this fact: we will actually *guarantee* the performance of our roofing materials for as long as twenty years, provided, of course, they are applied by an Approved Roofer, according to our specifications.

Koppers makes flat roofs for industrial *and* residential buildings. Specify Koppers, and you'll have the best in built-up roofing. Full information and specifications on request. Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pa.

KOPPERS

KOPPERS COMPANY, INC., Pittsburgh 19, Pa.

OTHER DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.

· SPECIFY KOPPERS FOR LONG-LIFE ROOFING ·

Only **LURIA ENGINEERING** *offers you*
the economies of

STANDARDIZED BUILDINGS

plus

all the ***adaptability*** *of*

CUSTOM-DESIGNED UNITS

This *single unit* LURIA STANDARDIZED BUILDING is used in the chemical equipment industry

The same LURIA STANDARDIZED BUILDING *— in double units —* modified to the requirements of a steel fabricating company

Multiple units, additional bays adapt LURIA STANDARDIZED BUILDINGS to the manufacture of agricultural equipment

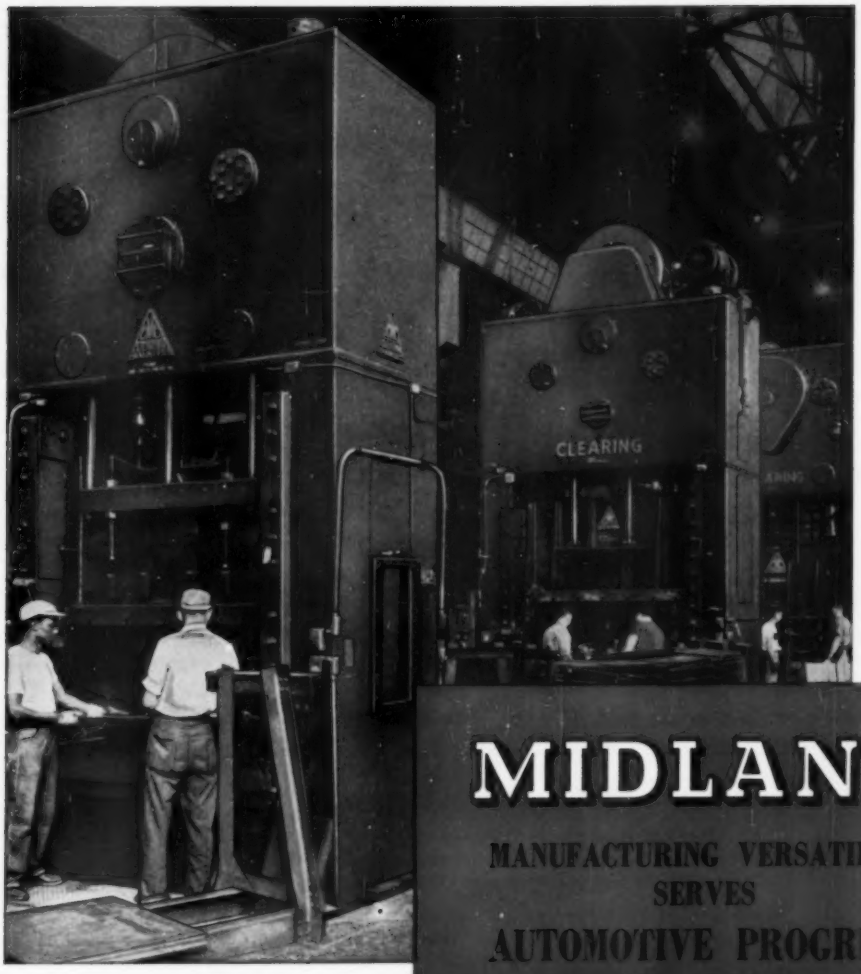
Put **high speed** *and* **low cost** *into your expansion program. Contact your* **LURIA** *representative* **today**

Practically *every* building requirement for your *individual* expansion program can be provided by Luria Standardized Buildings . . . for far less than the cost of custom-built structures . . . and in far less time. To this *adaptability* add Luria's quality materials and construction that surpass the most stringent building code requirements—and you have the reasons why Luria Standardized Buildings are first choice with leading American companies in *every* industry.

LURIA ENGINEERING
COMPANY

500 FIFTH AVENUE • NEW YORK 36, N. Y.

DISTRICT OFFICES:
ATLANTA, GA.
BOSTON, MASS.
CHICAGO, ILL.
PHILADELPHIA, PA.
WASHINGTON, D.C.



MIDLAND

MANUFACTURING VERSATILITY SERVES AUTOMOTIVE PROGRESS

AS THE automotive industry progresses—as the scope and problems of parts manufacturing become larger and more complex—industry leaders are turning to The Midland Steel Products Company of Detroit and Cleveland for an increasing number of production services.

The versatility of Midland engineers and manufacturing facilities has been of invaluable assistance to those concerns who require high-quality parts in large quantity at the most economical cost. For Midland is one of the principal—and most-experienced—producers of frames, power braking equipment, door control equipment, stampings, and various other units in this industry. Midland is also fully-equipped to develop, test, and perfect new parts.

If you have a production problem, consult Midland now—and step ahead in automotive progress.

THE MIDLAND STEEL PRODUCTS CO.

6660 MT. ELLIOTT • DETROIT 11, MICHIGAN

BLAW-KNOX, TOO, *is Integrated*

The facilities and services of nine manufacturing divisions working as a team

are at the disposal of all who plan and purchase for National Defense. From this one centralized source of engineered products and engineering services the Armed Forces can order a portable radio mast or contract for a complete ordnance plant or air base. Due to the wide range of industries we serve and products we make, Blaw-Knox is staffed with hundreds of technicians whose engineering skills run the gamut of the profession. If this experience plus our manufacturing facilities can assist your efforts, just "say the word."

OPERATING AND SALES DIVISIONS—

Blaw-Knox Equipment • Buflovak Equipment • Chemical Plants • Foote Construction Equipment • Lewis Machinery • National Alloy • Power Piping and Sprinkler • Rolls (Lewis and Pittsburgh) • Union Steel Castings

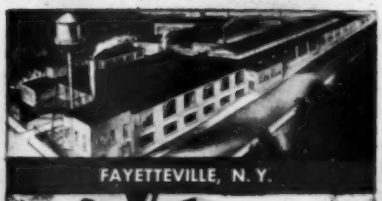
Recent catalogs and bulletins detailing information on Blaw-Knox products are available to the Armed Services. Write for those that interest you.

BASIC PRODUCTS FOR INDUSTRY

- Rolls for Steel and Non-Ferrous Mills
- Rolling Mills and Auxiliary Machinery
- Open Steel Flooring
- Prefabricated Piping Systems
- Open Hearth Furnace Equipment
- Fire Protection Equipment
- Chemical and Food Processing Equipment
- Concrete and Asphalt Road Paving Machinery
- Complete Chemical and Processing Plants
- Radio, Television and Transmission Towers
- Heavy Steel Castings
- Heat and Corrosion Resisting Alloy Castings
- Steel Forms for Concrete Construction
- Contractors Equipment
- Clamshell Buckets

BLAW-KNOX *Company** FARMERS BANK BUILDING PITTSBURGH 22, PA.

*Awarded seven "E's" for Excellence during World War II

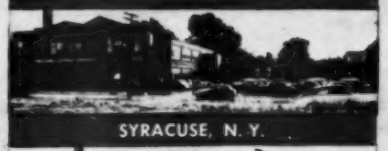


FAYETTEVILLE, N. Y.

FAYETTEVILLE, N. Y.
MAGNESIUM PLANT

FAYETTEVILLE, N. Y.

SYRACUSE, N. Y.



SYRACUSE, N. Y.

CORTLAND, N. Y.

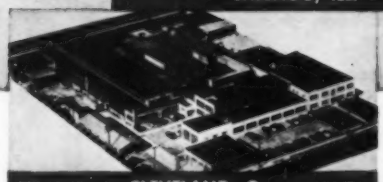
You Can Depend On QUALITY DIE CASTINGS From PRECISION'S

9 Completely Equipped Plants!

Out of these nine Precision plants comes a constant stream of top quality die castings to keep the production lines of industry moving to new high production peaks. Large and small users of die castings are assured of on-time deliveries of the best die castings they can buy.

Precision know-how in producing better die castings plus superior plant facilities can help you meet your production and sales quotas.

CHICAGO, ILL.



CLEVELAND, O.

KALAMAZOO, MICH.

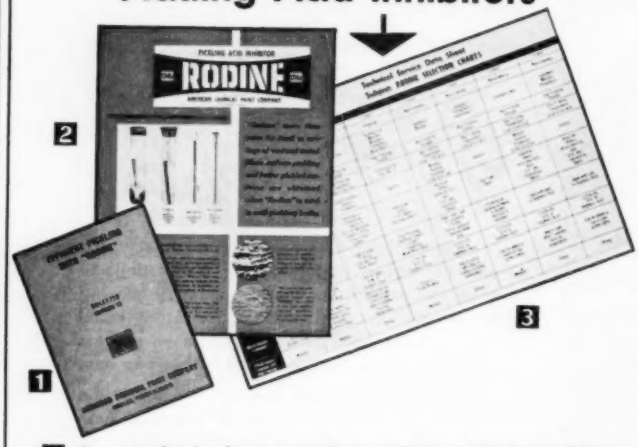
BRADLEY-EDLUND DIVISION
Edlund Drilling and Tapping Machines
Bradley Forging Hammers

PRECISION CASTINGS CO., Inc.
212 Walnut St., Fayetteville, N. Y.
Syracuse, N. Y. · Cleveland, O. · Chicago, Ill.
Kalamazoo, Mich. · Cortland, N. Y.
British Affiliation — Wolverhampton Die Casting Co., Wolverhampton, England

New Data Available on . . .

RODINE®

Pickling Acid Inhibitors



1 The standard reference work on pickling, "Efficient Pickling With RODINE" — Bulletin Number 13 — is now available in a new, revised edition.

2 This new 4-page general descriptive folder presents essential information on "Rodine" pickling acid inhibitors.

3 The recently revised "RODINE SELECTION CHART" gives characteristics of and uses for typical "Rodines" used with sulfuric and muriatic acids. Technical Service Data Sheet No. 13-1-1-4.

Use coupon below for free copies of the literature described above.

AMERICAN CHEMICAL PAINT COMPANY

***General Offices:* Ambler, Penna.**

Niles, Calif. Detroit, Mich. Windsor, Ont.

CHEMICALS ACP PROCESSES

CLIP AND MAIL TODAY!

American Chemical Paint Co.
Ambler, Pennsylvania

Gentlemen:

Please send me FREE:

- ☐ "Efficient Pickling With RODINE" — Bulletin No. 13.
- ☐ 4-page general descriptive folder.
- ☐ "RODINE SELECTION CHART"

Name .....

Company Name .....

Address .....

City ..... State .....

ATOMIC ENERGY

REACTOR PRODUCES POWER

The production of useful amounts of electric power by nuclear energy has been achieved from successful operation of a new type of reactor—the experimental homogeneous reactor—at Oak Ridge National Laboratory, according to Union Carbide and Carbon Corporation, which operates the laboratory for the Atomic Energy Commission.

To accomplish this, scientists brought a pilot model of the unique reactor system up to its full design power of 1,000 kilowatts of heat output. The reactor steam then was switched to a turbine generator, and about 150 kilowatts of electricity were produced. This is enough electricity to meet the estimated needs of 50 average 5-room dwellings.

The homogeneous reactor at Oak Ridge, capable of producing both fissionable material and electric power, is the first to operate at a temperature and power high enough for production of steam to run a standard industrial turbine generator. However, this reactor was not designed to produce economical electric power.

In this type of reactor, a single homogeneous solution serves as fuel, moderator, and coolant. The heat generated by the nuclear reaction of the uranium fuel in the solution is removed by pumping the hot radioactive liquid through a heat exchanger or boiler, which produces steam to drive a generator.

Construction of this reactor at Oak Ridge was started in March 1951, following two years of development and design by the scientists at Oak Ridge National Laboratory. The reactor "went critical," or first achieved a nuclear chain reaction, on April 15, 1952. Following the low-power operation, the experimental work will continue at higher power to acquire information regarding the feasibility of this type for full-scale reactors.

87,000 ACRES RELEASED

The Atomic Energy Commission has announced that it will release from restriction about 87,000 acres at the extreme east and west ends of the Wahluke Slope across the Columbia River from its Hanford production plants. The Commission accompanied its announcement with a warning that its action does not mean that all risk to life and property in the released lands has been eliminated.

At the same time the Commission reaffirmed its objection to farm settlement in the remainder of the slope area and described the nature of the hazard inherent

since 1931

CUTTING ENGINEERING OVERHEAD.....

A major contribution of independent production engineering firms to industry has been the reduction of engineering overhead through elimination of excess staffs to handle seasonal peaks or periodic overloads.

Yet this needed staff remains available on a few hours notice for either a complete engineering program or any part thereof.

With Pioneer as their leader since the 1930's, independent engineering companies have consistently cut overhead as well as manufacturing costs for their customers.

Pioneer
ENGINEERING
& MANUFACTURING CO., INC.

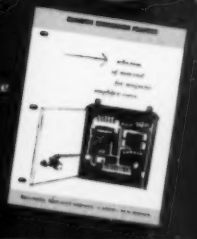
19654 John R Street
Detroit 3, Michigan

matched magnetic amplifier cores now available to specification

CORE STRUCTURES INCLUDE

- ☐ **WRAPPED CORES**—Microcores and Centricores for frequencies up to 100 KC
- ☐ **STAMPED RING CORES**—for greatest stability as light as .002"
- ☐ **DU LAMINATION CORES**—as light as .002" avoiding use of toroidal windings and providing maximum stability.

BULLETIN 52-1 is available to present data on selection of magnetic core materials and testing of magnetic amplifier cores.



	SPECIAL CORE MATERIALS INCLUDE
HYMU	Extreme sensitivity at initial permeability densities
SQUAREMU	Maximum squareness at lower flux densities
ORTHONIC	Maximum squareness at intermediate flux densities
SQUARESIL	Maximum squareness at power flux densities

MAGNETIC METALS COMPANY

Soft Iron and Alloy Cores and Shields

HAYES AVENUE AT 21st STREET · CAMDEN 1, N. J.

. . . HAVE ADVANTAGES IF YOU ARE PRODUCING MILITARY SPARE PARTS OR SUPPLIES.

MIL-C-12147 MIL-C-5405 DAPD-P-154

The advantages to you include lower packaging costs in that less labor is required on the assembly line and, in most instances, increased output results. Closing equipment is available on a rental basis.

The advantages to the military include a continuous barrier for each completed package. This offers maximum protection against mechanical failure in service handling, and with a minimum of error due to the human element in packaging operations.

Spare parts and supplies packaged in cans made under MIL-C-12147, MIL-C-5405 and DAPD-P-154 meet all the requirements of Method 1A and Method 1C, Unit Packaging, under MIL-P-116A. This packaging is approved and currently in active use by most of the technical branches of the service.

In addition, there is a growing acceptance for the use of these containers in many civilian applications.

Write or call us regarding any packaging problems confronting you at this time. We will provide the technical help.

The CLEVELAND CONTAINER Co.
6201 BARBERTON AVE. CLEVELAND 2, OHIO
• All-Fibre Cans • Combination Metal and Paper Cans
• Spirally Wound Tubes and Cores for all Purposes

PLANTS AND SALES OFFICES: Cleveland, Detroit, Chicago, Plymouth, Wisc., Jamesburg, N. J., Ogdensburg, N. Y. • ABRASIVE DIVISION at Cleveland SALES OFFICES: Grand Central Terminal Bldg., New York City; Washington Gas Light Bldg., Washington, D. C.; West Hartford, Conn.; Rochester, N. Y. Cleveland Container Canada, Ltd., Prescott, Ontario • Offices in Toronto and Montreal

Atomic Energy

in the operation at the Hanford Works plant. In other related actions the Commission:

1. Withdrew its objections to the construction across the slope, including the control zone, of such roads, railways, canals, and power and telephone lines as may be required for the development of the Columbia Basin Project area, subject to whatever restrictions may be imposed for security or safety reasons.

2. Stated that the area of the slope known as the control zone is being made a permanent part of the Hanford Works Reservation from which residents will be permanently excluded.

3. Stated that for safety reasons no towns or cities should be established within twenty-five miles of the Hanford reactor area.

4. Authorized the manager of operations at Hanford to establish a system for warning Wahluke Slope residents in the event of disaster and to encourage and assist in the development of an adequate evacuation plan for farm families which may settle on the newly released lands.

5. Authorized the manager to undertake an intensive public educational campaign to acquaint persons residing within an area where risk may exist with the nature of the hazard inherent in the plant's operation.

The lands released from restriction by the Commission comprise about 62,500 acres at the east end of the slope, including 23,000 acres under the Potholes East Canal which will enable the Bureau of Reclamation to examine the irrigation service possibilities from that canal. The newly released area also includes approximately 24,500 acres at the extreme west end of the slope. It is estimated that the Commission's action will permit the Reclamation Bureau to consider the irrigation of about 40,000 acres susceptible of crop production.

URANIUM FROM SHALE

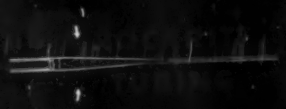
The Atomic Energy Commission has initiated a new phase in its long-range program of studying the uraniferous shales of the Southeastern United States. A small experimental mine will begin operations near Sligo, Tenn., in the near future to develop satisfactory methods of mining Southeastern shale deposits. The mine will be operated by the U. S. Bureau of Mines under contract with the AEC.

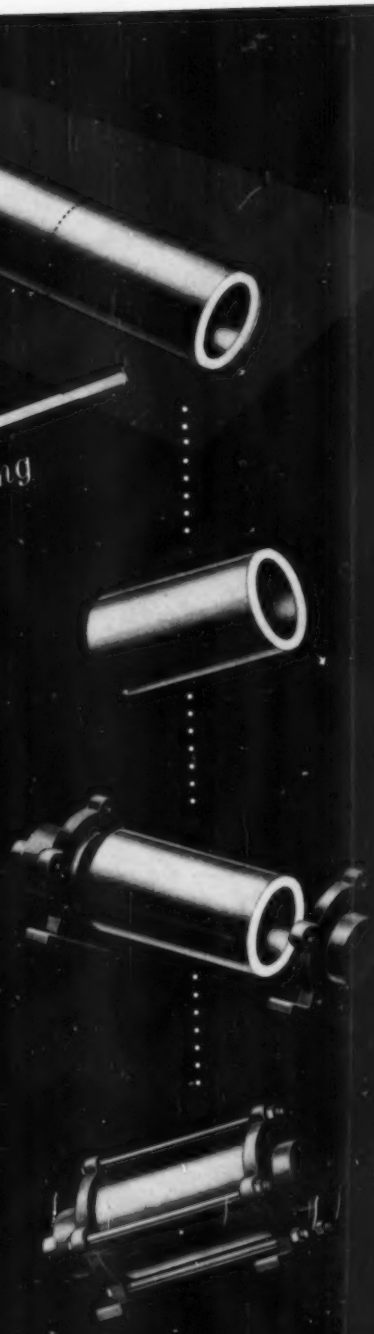
The Southeastern shale deposits, which underlie sections of several States, contain minute percentages of uranium and are of long-range interest to the AEC as a potential domestic uranium reserve. A widespread exploration drilling program is being conducted by the U. S. Geologi-

new cylinder tubing

eliminates boring and honing

You can realize startling cost savings when you use Rockrite* cylinder finish steel tubing for hydraulic cylinders, shock absorbers and similar parts. ● The inside is smooth, scratch-free—a surface just right for a piston with soft packing. Smooth bore surface plus exceptionally close dimensional tolerances means that this tubing can be cut-to-length and used as is. It is easy to make standard parts that are interchangeable. Slash your costs by using Rockrite cylinder finish tubing. ● Ask for Bulletin R-7 giving more data.





TUBE REDUCING
CORPORATION
WALLINGTON, NEW JERSEY

NON-METALLIC—SELF-LUBRICATING BEARINGS

YEP!
OSBEAR

THE LUBRIKON
HAS MOVED...

AND HIS COMPANY
HAS CHANGED ITS
NAME, TOO!

HERE'S OSBEAR'S NEW NAME
AND ADDRESS!

NeverOil
SINCE 1913

O&S BEARING & MFG. CO.
777 W. EIGHT MILE ROAD • WHITMORE LAKE, MICH.

cal Survey under contract with the AEC to obtain better knowledge of the uranium occurrences.

In the experimental mine near Sligo, the Bureau of Mines will apply its research knowledge and experience in mining and processing Western shales to the harder and more refractory Chattanooga shale formation. This formation has a lower oil content than the Western shales and has no current economic value. The Western shales, however, do not contain uranium.

RADIATION INSTRUMENTS

The radiation instrument industry, virtually nonexistent in 1946, had an annual business volume of approximately $20,000,000 and employed more than 2,400 persons in 1952, according to a survey conducted by the Atomic Energy Commission.

Growth of the new industry has paralleled development of the Nation's atomic-energy program since early 1947 when the AEC adopted a policy of encouraging its operating contractors to procure radiation instruments from commercial manufacturers. Before that time, security restrictions had required contractors to the Manhattan Engineer District, predecessor to the AEC, to design, develop, and produce their own instruments.

The surveys shows an expanding market for radiation instruments outside the AEC program as well as within AEC installations. According to the survey, military agencies of the Government now provide about fifty per cent of the total market. The AEC and its principal contractors provide about thirty per cent, and the remainder is accounted for by private users.

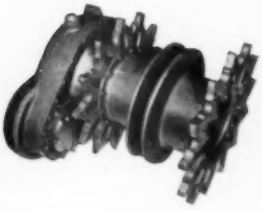
ZIRCONIUM FOR REACTORS

Scientists of the Westinghouse Electric Corporation have revealed how zirconium —a long-known but little-used metal—has been brought into mass production and is now linked with uranium in importance as a material for construction of a submarine "nuclear reactor."

Zirconium is one of the best materials for water-cooled nuclear reactors. Iron, steel, aluminum, and the other metals of normal strength and permanence are not satisfactory.

Zirconium is lighter than steel. It has remarkable corrosion resistance, an extremely high melting point, and is a fine structural metal in that it is quite strong and workable. Most important for its use in a nuclear reactor is the fact that it does not "waste" neutrons—the atomic particles that split uranium atoms and keep the atomic engine "running." Whereas some metals absorb these neutrons and thus interfere with atomic fission, zirconium offers no such interference.

Final Drive Assembly for M-47 Medium Tank



Prime Contractor:

THE OLIVER CORPORATION

Just one example of what Oliver is doing . . . evidence of the facilities at your command.

THE OLIVER CORPORATION

OLIVER

The OLIVER Corporation, 400 West Madison Street
Chicago 6, Illinois

2050956
25-27-1

The American Patent System

Sound Basis of Freedom and National Defense

Robert Clement Watson, appointed to the important post of Commissioner of Patents, is a charter member of the American Ordnance Association. For more than a third of a century Mr. Watson, whose photograph appears on the front cover of this issue, has been an active, effective, and valued participant in the Association's unique work for the national defense.

A resident of Silver Spring, Md., Mr. Watson was born in Washington, D. C., November 21, 1890. He is a graduate of Lehigh University and George Washington University.

During World War I, Mr. Watson was Army inspector of ordnance at the plant of Symington-Anderson Company, Rochester, N. Y., which manufactured 75-mm. guns, 6-inch trench mortars, and 240-mm. mortars.

He is a trustee of Lehigh and a member of the American Law Institute and the American Bar Association. In 1950 he was elected president of the American Patent Law Association.

Mr. Watson was nominated Commissioner of Patents by the President in January 1953 and assumed the duties of that office on February 18, 1953.

"THE patent system added the fuel of interest to the fire of genius."

This sage remark of Abraham Lincoln fittingly epitomizes the importance and significance of our traditional American patent system. The incentives, safeguards, and rewards of this system have always been a basic element in the remarkable progress of our country from very modest beginnings on the Atlantic seaboard to continental dominion.

Rights Protected

A sound basis for our admirable patent system was formulated in the Constitutional provision by which Congress was given the power "to promote the progress of science and useful arts" by securing to inventors, for a definite period, the exclusive rights to their discoveries.

During the 160 years during which our patent system has functioned, the United States has steadily advanced to its present position of technological supremacy from which our agricultural and industrial economy has drawn its power to achieve for our people the highest standard of living in world history.

Our patent system has undeniably fostered inventive resourcefulness. Under this system such men of genius as Robert Fulton, Elias Howe, Eli Whitney, Cyrus McCormick, George Westinghouse, Ottmar Mergenthaler, Charles Goodyear, Alexander Graham Bell, Samuel F. B. Morse, Thomas A. Edison, Henry Ford, and Orville and Wilbur Wright have conferred innumerable blessings and benefits upon mankind.

Today, as in earlier crises in our history, the patent-law system is one of the most essential and necessary bulwarks of a strong national defense.

Many informed observers are fully convinced that the technical superiority of our country, particularly in the field of atomic weapons, has been the decisive factor that has deterred unfriendly nations, in the past few years, from attempting aggression on a scale that might result in global war.

It is beyond argument that technical superiority is highly important in any consideration of national defense, that this superiority demands constant and intensive research along the frontiers of the physical sciences, and that every incentive should be given to scientific and industrial talent to contribute to national security while safeguarding individual rights.

But do our patents laws, as they exist today, provide this incentive in sufficient measure? What is the relation of industrial research and technological progress to the patent system? What is the interaction of the patent system and the antitrust and trade-practice laws? What about the relationship of patents to the development and encouragement of small business? And, most of all, what will be the permanent policy of Government toward the patent rights of those companies and individuals who undertake research and development in the field of armament improvement?

These are timely and pressing questions. For this reason one of the country's great universities recently established a patent foundation to conduct research in the patent field.

Admirable Achievement

This is an admirable achievement in which the new Commissioner of Patents has taken a leading part. As it progresses it will bring to our citizens a better understanding of the relationship of the patent system to American industrial and social progress.

Meanwhile, existing patent laws must be administered and new patents issued. The Nation is highly fortunate in having as Commissioner of Patents a distinguished lawyer who is well acquainted with our national-defense program and who, as a member of the American Ordnance Association since 1919, has given unswerving support to the Association's objectives.

THE FACE OF WAR, *with its suffering and sorrow, is revealed by this Korean mother as she flees southward with her young sons from the Communists invading her war-torn country (Army photo).*

COMMAND vs. STAFF

Staffs Should Advise; Commanders Should Command

Lieut. Gen. George H. Brett

Marine Corps

SINCE the beginning of World War II the public has been educated to an appreciation that the most important word in the military establishment is "Staff."

They read that the Chief of Staff has decided on certain plans for military action; the Chief of Staff for the Army visits Korea; the Chief of Staff for the Air Force flies to England—and in the minds of the public and many veterans the question arises, "What has become of the commanders?"

The German Staff

Prior to World War I, the military student was intensively interested in the idea of the German Staff. How did it function and where did it fit into the military picture? Hence, a short explanation:

The German Staff was divided into functional compartments prepared to set forth the plans for all forms of military operations. The G-3, or Operational Section, set up the strategic plans and followed this with the tactical plans for larger units. These plans were based upon information, both friendly and hostile, furnished by another compartment, G-2, Intelligence.

These plans were then turned over to G-4, Logistics, to furnish the necessary data pertaining to the feeding of troops, the clothing, housing, supplies, and equipment for all forces involved.

Then G-1, Personnel, was consulted as to the available personnel and where the men were coming from to carry out the plans as set forth.

In addition, and probably the most important compartment, was that of Industrial Mobilization. This section made extensive and continuing studies of the industrial potential to wage a war. The layout of shops, stockpiles on hand, the tools and production lines, and the sources of raw materials were carefully studied. Plans were worked out for the conversion from peace or commercial production to war or military production.

Information Important

The importance of this could not be overemphasized, for only on correct information from this source could proper plans be prepared or could the Germans embark upon a war. Industry had to be able to deliver the goods. On this information, and this information only, could the German Supreme Command finally decide as to its capabilities.

Sound Intelligence

It was practical. It was logical. It furnished an organization directly under the highest echelon composed of personnel who were experts in their lines and thoroughly educated in the problems to be solved. In brief, the highest command would be informed of the plans based upon sound intelligence. It gave a picture of personnel

requirements and where they could be secured. It furnished a carefully worked out schedule of material requirements, movements, and transportation. It gave an accurate picture of the industrial potential of the country to wage war.

Decision Easy

In fact, it gave such a picture that readjustments and requirements of the army, navy, and air force for personnel and materials could be decided easily.

It was due to this staff functioning that Germany in the first days of World War I made such tremendous strides and was able to carry through such magnificent operations. However, its very success depended upon the fact that it only set forth the plans of the highest echelon. It did not deal with carrying out the details which was left to the initiative of the lower-echelon command.

The plan set up the mission in general terms. It gave the necessary information and the tools and personnel available to the subordinate units. It only touched on details where there was a possibility of overlapping within the subordinate units.

The personnel comprising this staff were of the most experienced type. Their records of service undoubtedly covered all phases of military operations and problems. However, they were staff officers. They exercised no function of command and were not responsible for any military organization, large or small.

Immediately following World War I, the staff idea invaded the military establishment of the United States. The experiences of World War I had indicated clearly the necessity for enlarged staff organization. The problem of waging war was becoming highly complex and more highly technical. In addition, the areas covered by the theaters of operation had tremendously increased.

A Major Factor

One major factor was recognized as of paramount importance—industrial mobilization. It became an absolute fact that military operations were definitely dependent on the commercial production of the country.

During the period between World War I and II, steps were taken to keep abreast of the times, but due to lack of appropriated funds the mass of staff work at that time consisted of studies and plans for use in case of war. Very little was actually done in building up a competent and efficient war machine.

With World War II and its worldwide theaters, the necessity for staff organization became urgent. However, it grew like Topsy. Additional divisions and sections of the organization came into existence overnight. The pressure of war was great.

Inexperience was the rule, and it must be appreciated that wartime is an extremely poor occasion properly to organize a large military establishment. The result was the growth of a tremendous staff as each and every division or section chief called in more and more assistants in order to overcome inexperience.

Difficult Period

The war came to an end. The reconstruction period was on. Every one who thought he was good wanted out and out in a hurry, especially in the combat elements. It might be said that the retrenchment period after war is far more difficult than the build-up period before and during war. In the combat phases of the military establishment it seemed as though everybody was through. "The war was over, why linger?"

In the administrative phases, however, there were many who had become intensely interested. They had grown up in their jobs and were willing to continue. The problem of retrenchment demanded careful staff planning, so staffs were rebuilt, but unfortunately, due to separations there were not enough people in the lower echelons to carry out the plans.

Orders were issued and efforts were made to clear the situation, but complete results had not been accomplished when the Korean police action commenced. The ultimate result is evident. Staff grew. Staff ran things. Staff went into details down to the lowest echelon. In reality, staffs became commands.

Unification

Then came unification. A tremendously important move, but psychologically unsound in the designation of its authorities. The staff again came into the picture in the form of the Joint Chiefs of Staff.

The concept of the function of that body was most excellent, but its practical application was at fault. It was supposed to be the supreme military advisory body to the President, but its membership was composed of men who were endeavoring to function in a dual capacity—first, as staff members of what in Germany in World War I was the Supreme General Staff, and, secondly, as commanders of the three major components of the military establishment.

This designation of the Joint Chiefs of Staff in its beginning emphasized the power of staff and created the definite impression that the staff ran the military establishment.

Three Bosses

In addition, it placed the individual member under three bosses: first, the President and his Cabinet; secondly, the Secretary of Defense; and, thirdly, the Secretary of his respective branch. A man cannot serve that many masters and do an effective and efficient job.

Basically and psychologically, the designation of the head of a large military organization such as the Army, Navy, or Air Force as the "Chief of Staff" is wrong. The top man is the commander and should be so designated.

General Brett, now retired, is one of America's outstanding Air Force officers. Beginning his flying career with the Aviation Section of the Army Signal Corps in 1916, General Brett in 1941 became Chief of the Air Corps and during World War II served as commander in chief of the Allied Air Forces in Australia. He also served as commanding general of the Caribbean Defense Command and the Panama Canal Department. He is a graduate of the Command and General Staff School and the Army War College.

In an army you have corps. Each corps has a commander, and in a division, a subordinate part of a corps, you also have a commander. The staffs are purely and solely advisers to the commander and, as such, never issue a command.

Staff Increased

However, under present concept, it is apparent that the staff functions outweigh the responsibility of the commander. The present organization has created a tremendous increase in staff. This has been caused by the fact that the staff feels that it must work out any problem down to the minutest detail before transmitting it to the subordinate commander, thereby killing his initiative and reducing his position to one of chore boy.

There have been cases where the senior staff undercuts the subordinate commander and goes directly to his subordinate officers. In addition, today a commander often finds himself saddled with an officer to fill a certain position who has been picked by the senior staff but who may not be suitable to the commander.

Psychologically, it has created a wrong impression in the minds of the junior officers who now prefer to work for staff jobs instead of command jobs, as their experience and observation indicate that it is the staff that runs things.

It is firmly believed that, starting at the highest echelon, the staffs of the various echelons of command could be cut fifty per cent and that they then would function more efficiently and effectively. This would cause the staff to pass to the subordinate commands a general directive and permit the lower-echelon commander to work out the details on his own initiative in accordance with his experience, judgment, and the conditions under which he is working. It would likewise give a true picture of the ability of the commander.

"Buck Passing"

The present staff functioning may also work in reverse. Today a commander who makes a mistake can throw it back on his staff. This has created a buck-passing situation which is anything but good for military organizations.

May I cite one instance in my own experience. An officer taking over a command of a large defense area in which there were approximately eight independent commands noted that his headquarters staff consisted of seventy-six officers.

He carefully observed the functioning of this staff and found that it was doing much of the work which should have been done by the command and staff of the lower echelons. He gradually started cutting and within three months reduced his headquarters staff to twenty-six officers.

"The fact that civilians sit at the head of our military establishment is sound and just under our form of government, but command functions and responsibilities of our military organization should be in the hands of commanders and not staff officers."

Functions Restored

It quickly became evident that subordinate commanders were then able to function as commanders. It was found that general directives were sufficient. The initiative and knowledge of subordinate commanders permitted them to work up better and more detailed plans than the staff was capable of doing.

In one specific instance there was a great deal of discussion concerning the cutting of the staff of the lower command echelon. The solution, however, suddenly became very easy as a paper containing forty-nine endorsements came over the commanding general's desk. These forty-nine endorsements were written concerning the building of one concrete slab, eight inches thick by forty feet square. Every staff officer had to express an opinion in order to hold his job. The staff of that organization was reduced without argument.

Now for a little constructive criticism: The President of the United States as "Commander in Chief of the Military Forces" of this country should have a highly trained and highly specialized general staff, the Joint Chiefs of Staff, to make recommendations as to possible courses of military action. The Chief of Staff of this organization should be the highest ranking officer in the military establishment.

Three Services Next

The next echelon of command should then be the Army, Navy, and Air Force. These branches should have commanders who are held directly responsible to the President. The Secretary of Defense with his subordinate Secretaries for Army, Navy, and Air Force should be the directorate for the military establishment under the President, directing and supervising the civilian and administrative phases of the establishment, contacts with Congress, industrial mobilization, and contractual functions.

The commanding generals of the several branches would be directly responsible for the efficient and effective functioning of their respective branch. These three commanders would then hold a position corresponding to that of an army commander in a group of armies. Each, however, would have the added responsibility of recommending administrative procedure, research and development, and procurement to his respective Secretary.

One thing is certain—these commanders should not function as members of the Joint Chiefs of Staff who decide and direct the general over-all policy of the military.

Responsibilities

The fact that civilians sit at the head of our military establishment is sound and just under our form of government, but the command functions and responsibilities of our military organization should be in the hands of commanders and not staff officers.

It is again repeated that to call the military men who command the Army, the Navy, or the Air Force, "Chiefs of Staff" is illogical and psychologically wrong. They are commanding generals.

Canadian Defense photo

Canadian Military Procurement

Civilian Agency Negotiates All Defense Contracts

R. M. Brophy

NOT so long ago, civilian and military officials who met to deal with a common problem would have needed a referee rather than a guest speaker. At one time there was a wide breach between civilians and soldiers. In those days, wars involved a relatively small number of men fighting in out-of-the-way places.

Mutual Distrust

In general, military expenditures were small and the budgetary problems now associated with defense preparedness simply did not exist. There was often mutual distrust between the soldiers and the politicians.

Today, however, because military procurement is in the hands of a civilian agency in Canada, a system of interdepartmental coöperation has been developed between the armed forces and the civilian procurement department.

The military procurement function was first assigned to a separate civilian agency just before the outbreak of war in 1939, so that it is by no means a traditional policy in Canada.

A number of considerations led to the centralization of military procurement in civilian hands. It was recognized that some aspects of military purchasing had been unsatisfactory in the First World War. The main problem was lack of coördination in dealing with purchases made on behalf of the Allies.

Mr. Brophy is Canadian Deputy Minister of Defense Production. This article is based on an address by Mr. Brophy before the Industrial College of the Armed Forces, Washington, D. C.

Purchasing Missions

In addition to our own domestic procurement agency, the Belgians, French, and British all had purchasing missions in Canada. These missions acted independently and, in a number of cases, there was a scramble for supplies. This led to erratic price increases and to a general disorganization of the market.

To avoid a repetition of this experience, it seemed that a centralized pro-

curement agency was needed to deal both with our military requirements and with anticipated export demands.

By far the most important object of the decision to establish a centralized purchasing agency was to mobilize and allocate the productive capacity of the country in such a way as to meet military requirements in order of their urgency. In short, it was visualized that production scheduling on a national scale could be undertaken if necessary.

Accordingly, the Defense Purchases, Profits Control, and Financing Act was passed in 1939 authorizing the appointment of the Defense Purchasing Board which began operations in July 1939.

By the Spring of 1940, it was decided to establish a separate department, in place of the board, to handle military procurement. Accordingly, the Department of Munitions and Supply was set up and assigned far-reaching control functions, in addition to the responsibility for all military procurement.

In brief, this Department was empowered to direct and control war production in any way necessary for the furtherance of the war effort.

The Department of Munitions and Supply handled the procurement in Canada not only for the Canadian forces, but also for the United Kingdom, the United States, and for other allies. In the early stages, the requirements of other countries in Canada were essentially warlike stores and were of substantially the same type as the goods being purchased for the Canadian services. However, as the years passed, procurement in Canada by other countries included more and more goods of a civilian type.

Not Appropriate

It was therefore decided that it was not appropriate to apply the special purchasing procedures that had been developed for the procurement of munitions and general-service supplies to transactions which normally would have been handled through commercial channels, with prices and contractual conditions determined by commercial considerations.

To meet this situation a new agency, known as the Canadian Export Board, was set up in 1944 to handle procurement of civilian-type supplies for other governments. Because of the relation of this trade to the ordinary export trade of the country, this agency was established as a part of the Department of Trade and Commerce.

In carrying out the operations of the Canadian Export Board, it became apparent that the contractual relations with the purchasers and the suppliers would be materially simplified if the contracting agency were a Crown Corporation, capable of contracting in its own name rather than having all transactions direct with the Crown.

Accordingly, in May 1946, by an Act of Parliament, the Canadian Commercial Corporation was brought into being and took over the operations of the Canadian Export Board.

Activities Decreasing

While this agency for foreign procurement of civilian-type goods was being built up, the direct procurement activities of the Department of Munitions and Supply were decreasing. Thus, in February 1947, under appropriate authority, the procurement for the Department of National Defense was taken over by the Minister of Trade and Commerce, and arrangements were made for the Minister to utilize the Canadian Commercial Corporation as his agent in purchasing the requirements of the services.

While the Canadian Commercial Corporation acted as a principal in dealings with foreign governments, it acted only as an agent of the Minister in procurement of the requirements of the Canadian services.

As the Minister's agent, it performed the following functions: upon receipt from the services of details of their requirements, the canvassing of the market to determine the best source of supply; the awarding of the contracts; and the follow-up on deliveries.

It did not assume any responsibility for inspection, nor did it pay the suppliers—these two functions being the responsibility of the Department of National Defense.

To meet the needs of an expanded defense program after the outbreak of Korea, a separate Department of Defense Production was established on April 1, 1951, and the principles of military procurement developed during the Second World War were carried over into the new department.

Government System

Before going into the operations of our civilian procurement system, I would like to touch briefly on our system of government and how government expenditures are handled. One essential feature of this system is the concentration of legislative and executive power in the Cabinet. In Canada, members of the Cabinet are appointed from among the elected members of Parliament and are responsible to Parliament.

A Cabinet minister, as the head of an operating department, explains and defends the operations of his department in the House of Commons. At certain specified times, any member of the House has the right to direct questions to any Cabinet minister concerning the work of his department.

In Canada, where the executive is in the legislature and responsible to it, a vote of censure of administrative performance would cause the downfall of the government.

Much of our government's routine business is carried out by orders in

council which roughly correspond to the Executive orders of your President. Orders in council must, of course, be based on enabling legislation in the same way as Executive orders.

One must appreciate the rôle of the Cabinet to see how public expenditures are controlled. Initially, of course, Parliament provides certain funds to be spent on public business, including military procurement. However, expenditures, or appropriations as we call them, are approved by Parliament in rather broad categories. The approval of individual commitments is a Cabinet responsibility. This means that there is control over the details of expenditure at a very high level.

At the present time, any proposed

expenditure on military procurement involving an expenditure of $50,000 or more must be approved by the Treasury Board, which is made up of Cabinet ministers. There is some delegation of authority to commit smaller amounts, but it is quite limited except for competitive contracts under $10,000.

The Civilian Agency

Let us turn now to the operations of the Department of Defense Production, which is the civilian agency responsible for military procurement.

Once a requirement has received internal approval within the Department of National Defense, purchasing action is initiated by raising a requisition or contract demand. Contract demands describe the equipment to be purchased and must bear a certification that a sufficient sum of money has been set aside or encumbered to pay for the purchase.

This means that preliminary discussions between the Department of National Defense and the Department of Defense Production are often necessary in order to determine how large the financial encumbrance should be. Once the contract demand has been submitted to the Department of Defense Production, purchase negotiations can be started with prospective suppliers.

The department has developed a series of general conditions applicable to contracts which are published and which, by reference, are incorporated into all contracts.

The main set of conditions, which is applicable to all contracts irrespective of their nature, is known as Form DDP-26, and covers such matters as arrangements for subletting any part of the contract, inspection, acceptance and delivery, warranty, scrap, insurance, security, patent claims and royalties, termination, and other similar matters.

In addition to this form there are special conditions relating to aircraft overhaul, shipbuilding, ship repairs, capital expenditures, firm-price contracts, cost-plus contracts, construction contracts, and various others.

One of these sets of general conditions which is of particular interest is the one known as Costing Memorandum DDP-31. This memorandum sets out the classifications of expense that will be recognized by the department as properly constituting an element of cost. It has, of course, particular reference to any contract based on cost plus some fixed or percentage profit.

It could also relate to a negotiated-price contract in which the department might have agreed to a fixed price, on the understanding that it was based on costs computed on the basis of Costing Memorandum DDP-31 plus a given rate of profit.

The memorandum specifies a number of expenditures which may not be included as costs. The two exclusions which are perhaps most noteworthy are interest on borrowed money and selling expenses. These are excluded so that the department will not be placed in the position of expressing an opinion as to the proper or reasonable amount of such expenses.

"As an offshoot of its procurement function, the Department of Defense Production is responsible for the provision of capital assistance to defense contractors. The department, wherever possible, urges the manufacturer to provide, out of his own funds, equipment that is necessary for the defense production program.

"Nevertheless, it has been found necessary in certain instances to provide capital assistance in order to establish facilities . . . which have little or no civilian application. Assets so acquired are placed at the disposal of applicants by formal contract, but title vests in the Crown."

Where the Department of Defense Production is successful in obtaining tenders from a number of suppliers, it is generally assumed that the margin of profit of the successful contractor need not be a matter of special investigation, since competitive factors should insure that the best value is being obtained for the taxpayer's dollar.

In all cases where it is necessary for the department to examine costs and profit margins, the general yardstick which is followed is a profit rate of between five and ten per cent of cost. The actual rate varies, depending upon the nature of the industry, the size of the contract, and the type of the contract.

There is one type of procurement activity which deserves special mention. The Defense Production Act set up a revolving fund to finance the purchase of materials and components needed in defense production, the stockpiling of strategic materials, and the provision of working-capital advances in certain special circumstances.

While the fund has been used to buy such strategic materials as tin and quartz for indefinite retention, its most important use has been in the purchase of components for resale to prime defense contractors.

As an offshoot of its procurement function, the Department of Defense Production is responsible for the provision of capital assistance to defense contractors. The department, wherever possible, urges the manufacturer to provide, out of his own funds, equipment that is necessary for the defense production program.

Nevertheless, it has been found necessary in certain instances to provide capital assistance in order to establish facilities which, though essential to the defense program, have little or no civilian application. Assets acquired through capital assistance are placed at the disposal of applicants by formal contract, but title vests in the Crown.

Development Contract

There is one type of contract that I might mention, and this is one for the development of equipment for the armed services. When a firm receives such a contract it is paid for the development and the Government gets the know-how—which is made available to any firm in Canada when we go out to tender on the item in question.

To compensate the company for the know-how, we usually allow a ten per

cent profit on these contracts. We find that this system works out reasonably well as the companies who take these development contracts find that, as a result of working on the development, they are in a somewhat better position to bid on future orders.

Internal Audit

Another point that may be of interest is the fact that within the Department of Defense Production we have a little group which carries out what amounts to an internal audit of all contracts awarded by the department.

This group, known as the Contracts Authorization Division, operates independently of our purchasing and negotiating officers. They review contracts to satisfy themselves that the established procedures of the department have been complied with and that the terms of the contracts are in line with departmental policy.

The Department of Defense Production has three main operating branches: the Production Branch, which is responsible for the major programs that require specialized production; the General Purchasing Branch, which is concerned mainly with those things which can be purchased off the shelf; and the Materials Branch, which concerns itself with critical materials needed to carry out the defense program.

The latter branch, whose activities are mainly of a regulatory nature, is much smaller than it was a few months ago. As the supply situation improved generally and in line with the government's policy of keeping controls to a minimum, we have been able to reduce our staff in many divisions of the Materials Branch.

The other branches are of an administrative or service nature. The Administration Branch carries out the usual administrative functions and also issues invitations to tender and receives bids for all contracts handled on a tender basis.

The Financial Adviser's Branch, in addition to developing financial policy within the Department, includes the Contracts Authorization Division which I mentioned earlier.

I would also like to mention Defense Construction Limited, a Crown company which handles defense construction projects such as barracks, radar stations, and the repair and maintenance of military buildings for the Department of National Defense.

Among other Crown companies associated with the department are the Canadian Commercial Corporation, which handles U.S. Government contracts placed in Canada as well as those of other governments, and Canadian Arsenals Limited which is one of our major prime contractors in the gun and ammunition programs.

Services Fearful

When the procurement function was first turned over to a civilian agency, I need hardly tell you that the armed services were afraid that something very bad had happened to them. They were fearful that the new agency might undertake to police or screen their requirements and to tell them what they could and could not have. They were reassured on this point, and it was agreed that the purchasing agency would not exercise any review function.

I can perhaps best illustrate this by an incident in the House of Commons last year. At question time, Mr. Howe, the Minister of Defense Production, was asked if his department screened DND requirements, and he replied that if the services asked for a gold-plated piano, his department would buy it for them, but if they asked for a nickel-plated one, the department would question the request as nickel was in short supply and under control!

Problems Encountered

Problems are encountered in long-range procurement planning. It is often difficult to obtain good forecasts of future military requirements. This means that it is hard to assess the extent to which new facilities are needed for particular items. One might claim that this problem would be aggravated by the existence of a separate agency responsible for military procurement and production. I am not at all sure of this. I am satisfied that the difficulties of forward planning cannot be alleviated simply by uniting the two functions in one department of government.

I think one of the big advantages of the system is the centralization of procurement activity that is possible. It also eliminates a good deal of the conflict that arises when separate services are competing with each other for production facilities to carry on their individual contracts.

Under our system, the Department of Defense Production decides where contracts will be placed and can insure that the best possible use is being made of defense production facilities on an over-all basis.

It will be obvious to you that our procurement methods place a high premium on the coöperation of military and civilian personnel. In fact, military personnel are seconded to assist our purchasing people in dealing with technical and highly complicated equipment. Such coöperation is clearly fostered by mutual understanding and trust.

The same general considerations apply to international as well as to interdepartmental relationships. During World War II, Canada and the United States worked out satisfactory procedures for coöperating in the joint war effort.

Joint Resources Needed

With the increase in international tensions following World War II, which came to a head with the outbreak in Korea, we faced again the need for using our joint resources and facilities in a way that would make the best contribution to our common objectives.

We established a counterpart of the committee we had used so effectively in World War II and called it the Joint Industrial Mobilization Planning Committee. One of its most important achievements was the sponsoring of a statement of principles for economic coöperation which our two Governments accepted by an exchange of notes

on October 26, 1950. This document became the expression of policy for coöperation between our two countries.

It continued and brought up to date the principles and practices which had been established during World War II. But there were some highly important differences between the conditions under which our two countries now operated and the conditions under which we previously had worked so closely.

Cold War

In the first place, we were not in all-out war; we were dealing with the preparations for war, with the cold war, and with limited hostilities. The requirements of the military were not nearly as great as during World War II. This time a much smaller portion of the economy was given over to war production. Everything was done, not only to insure the immediate output of arms but to build up an industrial potential on which we could draw if it became necessary to mobilize fully.

Another important difference was the result of a major change in Canadian policy, which was to change over to U.S.-type equipment so that our armed forces and yours might fight together using the same equipment and the same supply lines. Large requirements against U.S. production developed rapidly, and Canadian production facilities were required to manufacture to U.S. designs and specifications.

It was now possible for the principles of coöperation to be translated into practical application to a far greater degree than before. The results, even in a relatively short period of time, have been important and indicate a healthy trend. The objectives of a directive of the U.S. Department of Defense dated November 27, 1951, entitled "Joint Industrial Military Coöperation with Canada," are being realized.

Canadian and U.S. military production is working toward common objectives; obstacles are being removed to the implementation of the principles under which we operate; channels for the exchange of information are being developed and used; secondary sources of supply in both countries are being established. The whole coördination effort is contributing to dispersal on a continent-wide basis. The problems are certainly not all solved, but the action which has been taken indicates that we are on the right track.

Canadian Defense photo

Canadian bazooka crew supports an assault somewhere in Korea.

It might be useful to mention one of the important arrangements in the field of procurement between our two countries. Following discussions, the U.S. Secretary of Defense on May 5, 1950, directed the three military departments and the Munitions Board to develop a program for the purchase of military equipment in Canada within the range of $15 million to $25 million for fiscal year 1951.

Target Raised

Later, on June 29, 1951, the target for U.S. procurement in Canada was raised to $100 million for fiscal year 1951, and on December 28, 1951, the objective went to $300 million for fiscal year 1952. These targets have been effectively met and the resultant contracts and orders have provided a major stimulus to Canadian production in military hard goods.

It is significant that the most recent directive of September 11, 1952, on the reciprocal procurement program does not set a specific dollar target for fiscal year 1953, but recognizes the policy that military procurement should be undertaken where it makes the most sense.

In view of the numerous historical precedents for close coöperation between Canada and the United States in the field of war and defense production, there is really no serious concern over policy. There are still a number of procedural and administrative issues in this field to be resolved. Most of these arise from the necessity of conforming to the Armed Services Procurement Regulations which are primarily designed to deal with domestic procurement and are therefore not entirely suitable for transactions with another government.

A number of problems relating to contracts with the United States armed services were resolved in a letter agreement reached in February 1952. This agreement provides for profit limitations, free inspection and audit services, the refund of Canadian customs duties, sales, and excise taxes, and prescribes methods of dealing with exchange fluctuations, administrative costs, government-owned facilities, etc.

Coöperation Developed

With the growth of understanding of common problems there has developed a spirit of coöperation. This has also occurred in the relations between our two countries, and I would like to pay special tribute to the excellent coöperation we have received from every one on this side of the border in working out satisfactory procedures and in clearing up any difficulties we have encountered.

The Defense of Europe

Status of the North Atlantic Treaty Organization Today

by

Gen. Alfred M. Gruenther

"Within the last three years the forces available to NATO have practically doubled in size . . . the effectiveness of the existing forces has been substantially increased."

IT is a sad commentary on the state of the world that the defense of Europe should be an appropriate subject for discussion nearly eight years after V-E Day. Unfortunately, however, the strains are such that the success of this defense project may well determine the fate of Western civilization.

To meet the threat of Soviet Communism, twelve nations of the free world formed the North Atlantic Treaty Organization, commonly referred to as NATO, on April 4, 1949. Last year Greece and Turkey joined NATO, so there are now fourteen member nations.

Top Political Body

The top political body of the organization is the North Atlantic Council, which meets in continuous session at Paris. The U. S. representative is Ambassador Draper. Two or three times a year the ministers of the member nations meet in formal sessions in Paris.

The Standing Group, consisting of representatives of France, the United Kingdom, and the United States, is the supreme military authority. It meets regularly in Washington. Gen. Omar N. Bradley is the U. S. member. Under the Standing Group there are several military commands. The one with which I am connected is called Supreme Headquarters, Allied Powers, Europe, usually referred to as SHAPE. That headquarters was activated by General Eisenhower on April 2, 1951, and it is now commanded by Gen. Matthew B. Ridgway.

General Ridgway's mission is to defend Europe. His area extends from the northern tip of Norway to the eastern border of Turkey, a distance of some four thousand miles. To facilitate defense planning, his area is organized into major commands as follows:

Four Major Commands

1. The Northern Command, with headquarters at Oslo, Norway is under a British Admiral, Admiral Brind. He has a unified command with army, navy, and air forces under him.

2. The Central Command has its headquarters at Fontainebleau, France, about thirty miles from Paris. For that area General Ridgway himself is in command with the land command being under Marshal Juin, a French officer, the air forces under U. S. Gen. Lauris Norstad, and the naval forces under Admiral Jaujard of the French Navy.

3. The headquarters for the Southern sector is at Naples. That area includes Italy, Greece, and Turkey, and is under U. S. Admiral Carney. He has under him land, air, and naval forces.

4. For the Mediterranean area the headquarters is at Malta, and the Mediterranean command is under British Admiral Mountbatten. So much for the command setup.

This is the text of an address by Gen. Alfred M. Gruenther, U. S. Army, Chief of Staff, Supreme Headquarters, Allied Powers, Europe, delivered before the members of the Michigan Post, American Ordnance Association, at their spring meeting in Detroit, March 18, 1953.

Coördinated Plan

Now, how are we doing? One of General Eisenhower's first tasks was to prepare a coördinated defense plan to meet any emergency. I am pleased to tell you that that plan has now been completed, and every commander in General Ridgway's area extending from the north of Norway out to the Caucasus knows exactly what he would do if an emergency should develop today.

This does not mean that the forces to implement the emergency defense plan are adequate. I regret to tell you that if the Soviets should execute an attack utilizing their full capabilities, General Ridgway probably does not have forces adequate to meet it.

Better Off Today

We are, however, instantly better off than we were two years ago when General Eisenhower started out. Furthermore, there are NATO plans for the increase of these forces, and if NATO is able to continue the upward trend—and I am sure it will—we shall reach a position where it will be extremely unprofitable for an aggressor to attack us.

General Ridgway therefore considers that his fundamental mission is to preserve the peace by making an attack of aggression extremely expensive to an aggressor.

From time to time Soviet propaganda announces to the peoples of the

captive nations and to the world that NATO's intent is an aggressive one. I can assure you that during the two years that SHAPE has been in existence there has never been a single sentence written which involves an aggressive war plan. Our plans are defensive and based entirely on the assumption that the enemy takes the first aggressive move.

Instant Retaliation

I can tell you, however, that if an enemy does take that first step our plans are based on instant retaliation to the extent that our capabilities permit, and I can also assure you that those capabilities are constantly increasing.

The Soviets now have approximately four million men under arms, organized into 175 land divisions—the most powerful land force in the world—some 20,000 operational aircraft, and a very powerful submarine fleet. SHAPE plans are based on a consideration of the capabilities which that force could execute if the decision were given by the men of the Kremlin.

I do not say that such a decision is going to be made. That involves an estimate of enemy intentions, and that determination is a matter which lies within the field of governments.

Estimate of Forces

General Ridgway has presented to the North Atlantic Council an estimate of the forces which are considered necessary effectively to meet such a threat if it should develop, and the North Atlantic Treaty nations are now in the process of building their forces to reach this goal.

Within the last three years the forces available to NATO have practically doubled in size. In addition, the effectiveness of the existing forces has been substantially increased. Within the NATO countries the military budgets have more than doubled during this period of time. Moreover, the conscription in many of the countries has been increased. In other words, the North Atlantic Treaty nations have made considerable progress.

Above all, the concept of collective security has been accepted without question. No longer is there any feeling that any one nation, whether it be the United States or little Luxemburg, can provide an effective defense system by its own means.

What are some of our problems? First of all, as I have indicated previously, our forces still are not adequate. Air power is the dominating factor in military planning today, and the creation of air forces is therefore of top priority.

> *"The United States of America is now the unquestioned leader in the world, and our associated countries in NATO, as they go forth to work out a collective defense system, are looking to the United States for guidance and support."*

Next we have the question of building up satisfactory reserve forces. General Ridgway's strategy is based on the minimum number of active forces and the creation of the maximum number of reserve forces which can be mobilized on an instant's notice and which can fight effectively within a very few days.

The creation of effective reserve forces is one of General Ridgway's major problems. It means that men who belong to reserve organizations will have to spend a certain amount of time—say from three to four weeks—each year in military training. That, of course, involves time away from their normal pursuits and presents a major economic problem for each of the member countries.

Burning Question

As you know, the question of German participation in the defense of Europe is now a burning question. Six of the European countries, France, Belgium, The Netherlands, Luxemburg, Italy, and West Germany have prepared the framework of a European Army which will permit of German participation.

That treaty, known as the European Defense Community Treaty, is now before the six parliaments for ratification. There are reasonable expectations that it will be passed by the six countries within the next several months.

From the military point of view, that project is an extremely important one, because the availability of German forces will permit the creation of a shield in central Europe which will enable us to mobilize our reserves while the active forces meet the initial onslaught. Obviously, the German forces are very well placed to perform that mission.

Of course it cannot be overlooked that the participation by Germany in the European Defense Community creates many political problems, and those are now being considered by the various parliaments.

Another major problem is that some of the North Atlantic Treaty areas are engaging in conflicts in other parts of the world—the United States in Korea, the British in Malaya, and the French in Indo-China.

The French Campaign

The French effort in Indo-China is, in my opinion, improperly understood in the United States. One-third of the French military budget is now going for the Indo-China conflict, which has been going on since 1946. Each year the French West Point, Saint-Cyr, loses approximately one of its graduating classes in the Indo-China struggle. The over-all casualties have been very heavy.

The resulting stalemate in that area has been a tremendous drain on France, and it makes the creation of adequate French forces in Europe a difficult one.

I would say that perhaps our major NATO problem is the maintenance of a sound economy. It will profit very little if, in building up a defense force, the economies of the NATO nations are wrecked. Perhaps our biggest asset in that field is the economic potential of the United States.

The North Atlantic Council is now engaged in a serious study to determine what portion of the national as-

sets can be diverted for defense purposes. General Ridgway has stressed to all officers at SHAPE the absolute necessity of making the requirements for SHAPE forces the minimum ones which will accomplish the mission, because he recognizes the significance of economic strains.

What Can A.O.A. Do?

The question arises as to what part members of the American Ordnance Association and similar groups have in this project. First of all, I think we should make it unmistakably clear that the struggle which exists in the world today is basically a struggle to overthrow the very system which you gentlemen of the A.O.A. have done so much to create—a system of free enterprise with coöperation between management and labor. A free bargaining system is anathema to the Communist system.

We now have before us a challenge as to whether the free-enterprise system, with its emphasis upon the dignity of the human individual, is going to be able to exist in the type of world in which we live.

You gentlemen have proved without question your excellence in the field of production. As a result the United States has attained a position of power which is unparalleled in history. It carries with it, however, very grave responsibilities.

The United States of America is now the unquestioned leader in the world, and our associated countries in NATO, as they go forth to work out a collective defense system, are looking to the United States for guidance and support.

Military Aid Programs

You have had the evidence of this support in our Military Aid Programs. The Military Aid Programs are furnishing equipment which is arriving in increasing quantities now. Without it there would be nothing more than a shambles in the defense structure which is being set up.

The question is going to arise as to the length of time that such aid can continue and the economic burden which the United States can bear.

In addition to the financial side, there is very definitely the spiritual side, too. We are working in a collective-security system for each one of the fourteen nations represented in the North Atlantic Council. Each one of these is a sovereign power with rights, sensitivities, and internal political problems. We have the job of leadership in this group to the end that an effective collective defense system be established.

As you look at NATO and consider that there are fourteen sovereign nations represented, you could say that such an organization cannot possibly work. I think I could prove to you, mathematically, that it cannot work. At the same time, I can prove to you that, for the sake of civilization, it *must* work.

If this effort fails, we deserve to go down in the chaos which will surely ensue. I am not pessimistic on this matter, but I do say that the first two years, in my opinion, will prove to have been the easiest two years.

Great Danger

Our great danger is that we may be tempted to divide among ourselves. Stalin in his speech before the Soviet Congress last October stated that. He also stated that his hope was that the Western nations, by reason of commercial rivalries, would so disintegrate that the Soviet Union would be able to walk in and take over.

The only element where the Soviets have an advantage over us of the West is in the field of unity. They get that unity by the gun-in-the-back method. We have to get it by the intricate and the very difficult method of coöperative negotiation.

Some one has referred to NATO as an administrative monstrosity. I could say that you could probably prove a pretty good case that it is a cumbersome organization.

Great Britain, as you know, for a hundred years was the leader of the free world. And throughout the British population, and especially throughout the British school system, practically every man was taught the responsibilities of Great Britain in its rôle of world leadership. For our defensive alliance to succeed I am convinced that we are going to have to do the same thing.

Spiritual Leadership

It is not enough to be having an excellent production line. The production problem part is on the way to solution, but the moral and spiritual leadership, the understanding of these nations, is still a problem that challenges our best efforts. I can think of no better organization in the whole world to assist than the American Ordnance Association.

You realize that we are confronted now with a new peace organization for collective security, the implementation of which presents many difficulties that must be resolved.

The first question that always comes up is, "Are our allies doing their part?" And you can prove, I am sure, that the allies are not doing their part. It is also possible that they may be able to prove that we are not doing our part.

Detroit and our other great American production centers are being defended from an area 3,000 miles away. We cannot defend Detroit from Selfridge Field. It is being defended in Western Europe. NATO, in the final analysis, is your defense and your problem. It is up to us as United States citizens to see that this organization works.

What I am pleading for is a greater understanding, a greater interest, on the part of the American public in this very important problem. I am not asking you to rubber-stamp what we are doing. We welcome criticism. The one thing we cannot survive is indifference.

Obligation Discharged

We have discharged the obligation which General Eisenhower has imposed on us. The four hundred and six officers who are in our headquarters now, and a corresponding number in the subordinate headquarters, are dedicated to this purpose. They will devote the rest of their lives to it because in it is the sole hope of preserving peace.

The Skysweeper

Army photo

The Army's New "Artillery Machine Gun" Can Defeat Fast Jet Aircraft

THE Skysweeper is the Army's largest caliber automatic antiaircraft artillery weapon. Ordnance experts refer to it proudly as an artillery machine gun.

It is the first weapon to emerge in the atomic age with radar, computer, and gun on one carriage. It is the first weapon in the twentieth century that possesses a fully integrated gun and fire-control system.

Lieut. Gen. Williston B. Palmer, Assistant Chief of Staff, G-4, recently referred to the Skysweeper as "undoubtedly the finest weapon of its type in the world. Skysweeper will make our antiaircraft defenses several times more effective. It represents an entirely new concept in Army antiaircraft artillery."

Can Detect Jets

Skysweeper's radar can detect and follow the modern high-speed jet aircraft under all conditions of weather and darkness. The target information given by the radar to the computer enables the computer to determine the flight of the aircraft, automatically transmit gun orders, and point the gun. The gun fires shells with proximity fuzes which burst when they come within lethal range of the target.

Conceived Decade Ago

This concept of an integrated radar-computer-cannon on a single mount was first conceived a decade ago by Army Ordnance Research and Development and the Sperry Gyroscope Company. Sperry's long and faithful work on antiaircraft development goes back more than a third of a century—a period of startling evolution of both gun and target!

Four years ago Army Ordnance selected Sperry to develop the first production design and to produce one prototype production model of the Skysweeper system which would be suited to high-volume manufacture.

"Package Plan"

This year marks the third anniversary of the initiation of an extensive "package" subcontracting plan to accelerate mobilization plans and quantity production of the system. This plan includes twenty-four major "package" subcontractors, in addition to the hundreds of suppliers manufacturing parts designed specifically for this system.

Delivery of the first production Skysweeper fire-control system from the Sperry manufacturing line at Great Neck, N. Y., to Army Ordnance Arsenals was made in February 1951.

Last year, under a technical assistance agreement, Sperry furnished the AC Spark Plug Division of General Motors with the background of engineering data and manufacturing methods to facilitate additional production of fire-control systems.

Deadly at Four Miles

Skysweeper finds and tracks approaching aircraft as far away as fifteen miles. It fires on, and destroys, air targets as far away as four miles.

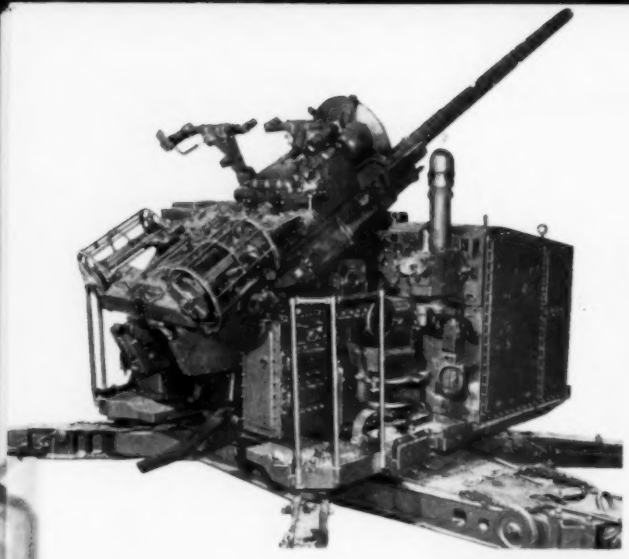
The unit is mobile and is towed by a cargo tractor. It can be emplaced on either rough or level terrain and have its radar operating in five minutes.

The new weapon weighs ten tons and can be transported by air. In the traveling position it is twenty-five feet long, eight feet wide, and seven feet high.

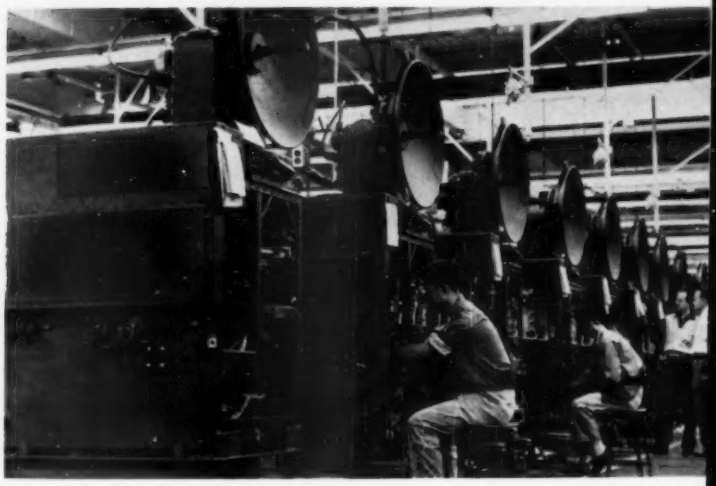
The 75-mm. antiaircraft gun has automatic loading and firing features. Armed with proximity fuzes, high-explosive shells weighing 12½ pounds each are fired at a rate of 45 rounds a minute. A proximity- or radar-fuzed shell explodes automatically at a predetermined distance from the target.

Ammunition is automatically fed and rammed into the gun from two 11-round magazines by an electrically operated rammer. Firing is controlled remotely by either the radar operator or the computer operator. The gun breech is opened automatically by the counterrecoil movement of the gun.

The Skysweeper is a three-in-one antiaircraft weapon that can spot and track with radar, and aim and fire the gun automatically at high-speed air targets flying at low and medium altitudes. It can also be used against tanks and other ground targets.



Left, the 75-mm. Skysweeper is the first weapon with radar, computer, and gun on one carriage. It is designed to spot and track, to aim and fire automatically at aircraft flying at near-sonic speeds.



At right, technicians at the Sperry Gyroscope plant complete fire-control systems now in quantity production for use in the Army's new Skysweeper antiaircraft gun.

Skysweeper crewman, below, uses the target selector to locate invading planes overlooked by the gun operators.

Below, the computer operator on the new 75-mm. Skysweeper watches the approach of a jet plane through the periscope.

Crewmen, right, load the Skysweeper antiaircraft gun during a recent demonstration of the new automatic weapon held at Fort Myer, Va.

Capable of operating day or night regardless of weather conditions, the Skysweeper fires a 12½-pound proximity-fuzed shell which explodes automatically at a predetermined distance from the target. The new gun operates at the rate of 45 rounds a minute.

Left, technician at the AC Spark Plug Division of General Motors checks connections for one of the 40 wiring harnesses needed in the Skysweeper gun.

Shown, right, ready to fire, the 75-mm. Skysweeper is the Army's newest and most effective weapon against high-speed planes.

Radar sweeps the entire sky automatically once every forty seconds. It can detect an aircraft within a 15-mile radius and shows it visually as a "blip" on a cathode ray "picture" tube in the radar control panel. It transmits target information automatically to an electromechanical computer.

Plots Speed, Range

The computer automatically plots range, speed, and course of the approaching target and determines where the gun must point so that a shell will intercept and destroy the target—just as a duck-shooter's gun must "lead" the duck.

The computer automatically feeds future target position data into a power control which translates it into corresponding gun motion.

Skysweeper is almost entirely automatic. Once the gun is emplaced, the radar operator pushes a button which causes the radar scanner to rotate, scanning the skies in a continuous circular sweep.

When planes appear on the "picture" tube, the operator depresses a "deadman" foot pedal which stops the rotation of the radar scanner. He immediately makes minute adjustments in range, azimuth, and elevation, and then releases the foot pedal for automatic operation.

Automatically the radar continues to track the target and feeds target data to the computer. The computer plots the future position of the target and aims the gun at this future position.

Fires Automatically

As the target comes within gun range, either the radar operator or the computer operator squeezes the firing trigger. The gun continues to fire automatically.

The research, development, and production program on Skysweeper was carried on by the following: Watertown Arsenal, Sperry Gyroscope Company, AC Spark Plug Division of General Motors, Frankford Arsenal, Aetna-Standard Engineering Company, the Franklin Institute, American Machine & Foundry Company, United Shoe Machinery Company, Wheland Company, National Forge and Ordnance Company, Cameron Iron Works, Watervliet Arsenal, and Rock Island Arsenal.

The following "package" assembly subcontractors took part in the Skysweeper production program:

Argus Cameras, Inc., Brown & Sharpe Manufacturing Company, Burroughs Adding Machine Company, Dictaphone Corporation, Diehl Manufacturing Company, a Division of

Singer Manufacturing Company, Eastman Kodak Company, Charles Engelhard Company, Fairchild Camera & Instrument Corporation, Ford Instrument Company, a Division of Sperry Corporation, Gilbert & Barker Manufacturing Company, and International Projector Corporation.

The following sixteen companies also took part in the Skysweeper production program:

Part in Production

Karp Metal Products Company, Keuffel & Esser Company, Kollsman Instrument Company, Knapp Monarch Company, Lewyt Corporation, Okonite Company, P. M. Industries, Inc., Steel Products Engineering Company, Stromberg-Carlson Company, U. S. Rubber Company, Vickers, Inc., Waterbury Tool Company, and Wright Machinery Company.

The testing of the new weapon is done at the world-famed Aberdeen Proving Ground in Maryland. The complexity of the entire unit makes necessary one of the Army's longest training courses for maintenance personnel—48 weeks. This is conducted at the Ordnance School at Aberdeen.

Some idea of the complexity of the new weapon may be gained from the fact that Skysweeper's fire-control system contains 317 electron tubes, 572 fine-pitch gears, 12,000 different parts, and nine large wiring harnesses, each containing from 100 to more than 600 wires.

Skysweeper uses more than two miles of wire—nearly 11,000 feet. This wire is cut into 2,800 different lengths and every piece has its special place in the system.

The insulation and all exposed ends of the wires are treated with a special substance that prevents fungus growths —just in case the instrument is used in a climate where fungus is present.

Fungus Preventive

Under ordinary light the substance cannot be seen. After treatment, therefore, the wires are viewed under "black light" which causes the fungus-preventive to glow. This inspection is to make certain that all exposed ends have been treated.

The wiring is set up into various assemblies called wiring harnesses. Women assemble each of the harnesses; some of the larger ones take two days to complete. Workers use specially mapped tables, along with blueprints, to tell them where each of the wires goes. Wires are carefully tied together along their entire length so as to hold them in place and prevent chafing.

It takes many hundreds of man-hours to assemble one Skysweeper and 250 hours to test it. Cleanliness is vital, and all air is filtered into the factory.

Skysweeper is unique for a number of reasons. It fills a gap between light and heavy aircraft weapons. It is the first complete automatic system on a single mount. It overlaps both light and heavy antiaircraft systems. Its firing rate lies between the single 40-mm. gun and the 90-mm. gun. Its muzzle velocity and effective firing range approaches that of the 90-mm. weapon.

Its effectiveness against low-altitude, small, fast targets, which cannot be seen easily compares favorably with that expected of rockets.

All-Weather Gun

Skysweeper operates day or night, regardless of weather conditions—even when aircraft are invisible in a blanketing fog. It can be used against tanks as well as invading planes.

Military experts emphasize the fact that we are at grips with an enemy possessing almost limitless manpower. It is a matter of necessity that we exploit to the utmost our technological superiority, the priceless knowledge of our scientists, engineers, and ordnance experts, and the unmatched skill of our workers who man our great production lines.

The M47 tank, right, owes much of its maneuverability to the Allison CD-850 transmission shown in cross section, insert.

Continuing Preparedness

How To Preserve Defense Facilities for Future Emergencies

R. J. Emmert

Mr. Emmert is head of the facilities and processes staff of the General Motors Corporation, Detroit, Mich.

In a recent talk before the Industrial College of the Armed Forces, Washington, D. C., Mr. Emmert discussed the facilities now being built for war production and the problem of retaining and preserving those facilities after current procurement programs are greatly reduced or discontinued.

Mr. Emmert reviewed the events of the past forty years and pointed out that this country has been in some kind of a conflict or economic disturbance during the entire period, and our future outlook is none too peaceful.

The author also emphasized the basic reasons for the very substantial increase in the standard of living of our people in this country and why these fundamentals should be applied to the design and production of military weapons. The accompanying article is based on Mr. Emmert's address. —THE EDITORS.

WHAT are we going to do with our facilities for war production after we have completed the current procurement schedules and after our present emergency has cooled off?

Are we going to make the same mistake we made after World Wars I and II when we tore these facilities down and substantially scrapped tools and plants?

National Problem

Do we not have a national problem in working out, *on a continuing basis*, a plan to defend ourselves—a program of weapons development and the preservation of facilities for the production of these weapons?

We have learned that tools are exceedingly important in the manufacture of any product—and I refer not only to machine tools but to the special tools required for a particular part; the cutting tools, the hoists and conveyors for doing the heavy work which at one time was done by backbreaking effort. Now we substitute horsepower for manpower in the production of things that people want.

To say it another way, we have learned how to increase the productivity of our employees, and by this I mean the ability of the individual to produce more of the things we want with the same, or a lesser, amount of physical effort.

Little Understood

This development has been the largest contributing factor to the increase in our standard of living. It is a concept that seems to be little understood by the majority of people in the world at large, and even in our own country. It is considerably different from increasing production by putting more people at the task.

We do not increase our standard of living by simply utilizing more people to produce goods with the same old

Above, the M41 light tank pictured during demonstrations at Aberdeen.

methods and tools. We increase the amount of things that you and I and the rest of us want by increasing the ability of individuals to produce more with the same effort and in the same period of time.

The time element is exceedingly important and might be used in the same definition of productivity by stating that it is the ability of the individual to produce more in a unit period of time.

In the automobile industry we have learned how to increase our productivity to the extent that we continue to produce year after year finer and better automobiles at a cost which enables substantially everybody in our country to own one.

Larger Plants Built

In the process we have built larger plants, have acquired more efficient machinery, have learned how to design better tools, and have utilized electrical power to do our work. And I might add that the science of good management has played a large part in this improvement.

Three times within my own memory when our country faced an emergency the armed forces have turned to the automobile industry and to the metal-cutting and fabricating industries to produce the weapons needed for the defense of our country and for the successful waging of a war.

It is exceedingly important that members of the armed forces understand the fundamentals involved in our productive system and, particularly, the means by which we have improved the productivity of our people.

Continual Striving

I wish particularly that you would note and keep in mind our continual striving to produce a better product and the tremendous effort being exerted to reduce the cost of the product by increasing the productivity of the individual.

In time of war, much of our manpower is called into the services, and the working force available to industry is reduced. Yet the demand for production is greatly increased.

Large output of war matériel can be achieved only by a high order of productivity accomplished by the design of weapons for low-cost production, by the use of readily available material, by the use of high-production equipment most suitable for the purpose, and by efficient management.

At the start of World War II the automobile industry put aside the manufacture of cars and household equipment and jumped into the manufacture of military items. At the start of the war, private industry knew very little about the weapons they were requested to make and, because of the urgency of the situation, had little time to study the drawings and details before ordering machinery and tools.

Industry tried to follow the process of manufacture used in the arsenals. It became apparent that parts were not designed to permit large-quantity production; that materials specified were not available in sufficient quantity; and that costs were very high.

Parts Redesigned

Manufacturers soon found that there were better ways to make these weapons and put all their engineering talent on the redesign of the parts and the substitution of materials. Large cost reductions were made.

At the end of World War II, when we seemed to have won the war and thought we would never have another, we scrapped military tools and facilities in privately owned plants and went back into the production of civilian goods.

When we get into an emergency, the whole country is confronted with a volume of rules and regulations. Considerable confusion naturally results. Therefore it is highly desirable in any plan for continuing national defense to have many of these problems worked out in advance.

The military services have recognized this in their planning by having industry establish facilities for the production of war matériel greatly in excess of that required to produce current procurement schedules, but many mistakes were bound to creep into any such program because industry had not had previous experience in producing these items.

Preserving Facilities

My efforts have been directed toward a plan for retaining and preserving the facilities we now have built up at such a great cost and preserving them in such a manner as to insure having them always available for use in the shortest reasonable time consistent with cost. Any such program applies to one situation much more appropriately than to others. Considerable judgment would have to be used in applying policies established for any plan. Contracts for the procurement of large and small items of every conceivable nature have been developed by contracting officers of the

services in coöperation with the manufacturer.

With similar coöperative effort utilized in the formulation of contracts for the retention of facilities, many conditions not now known which will apply to individual cases could be worked out satisfactorily.

The suggestions I am about to make apply to the production of end items and less to the fabrication of primary materials such as chemicals, steel, magnesium, and aluminum. My thinking is based on the end items which my company is manufacturing. They include the light M41 tank; the CD-500 and -850 transmissions for tanks; 90-mm. guns; the Allison J-33, J-35, and T-40 jet engines; the Sapphire J-65 jet engine being made by Buick with the assistance of many of our other divisions; ammunition, such as the 75-, 90-, and 105-mm. shells; 3.5- and 4.5-inch rockets; military vehicles such as the 2½-ton, 6 x 6, GMC truck; electronic and mechanical devices such as radio receivers and transmitters, bomb sights, bombing navigational computers and fire-control systems, range finders, Diesel engines, and complete airplanes.

I have listed all these to show the wide variety of items which have been considered in this proposal.

Since the start of the Korean action, the Government has invested about $2.5 billion in machinery and equipment. Of this amount, approximately half has been placed in plants of private industry and the other half in plants in the military reserve.

There is no problem of keeping facilities in plants in the military reserve, since the entire property is owned by the Government; but in those plants owned by private industry there is a real problem.

Packaged Facilities

We are suggesting that, in privately owned plants manufacturing military items similar to those just mentioned, the Government-owned facilities presently being used should, after supply contracts have been completed, be retained in the form of a "package" and under the manufacturers' cognizance so that they will be available at any time and on short notice for use again in case of an emergency, and for the production of items similar to those now being produced.

Where new buildings are being erected by private industry it is suggested that the plans be made large enough that space will be available in these new plants for the storage of Government-owned facilities when it no longer becomes necessary to manufacture military items.

In those cases where additional manufacturing floor space has not been erected and Government machinery was set up in space formerly used and subsequently needed for commercial production, we suggest that the Government-owned facilities be stored in buildings which are least suitable for manufacturing purposes and, if no such buildings are available on the property, that warehouse space be leased by the contractor or that warehouse-type buildings be erected on the contractor's property for such storage.

Changes Necessary

Of course, this is practical only if the program can continue over a reasonably long period of time. Therefore, it appears necessary to have changes in the present law, or a new law, which would permit the Defense Department and the military services to enter into long-time contracts with the contractor for such storage and the appropriation of sufficient funds to reimburse the contractor for the costs involved.

Advisory Committee

I happen to be on a civilian advisory committee, known as the National Industrial Reserve Review Committee, which was established by law to advise the Government regarding the retention or sale of surplus plants after World War II and to advise regarding the maintenance of these plants.

When the Korean action started, these problems were immediately solved inasmuch as practically all the surplus plants were put back into operation for the production of military items.

However, this has given the committee an opportunity to look objectively at the mistakes of the past and to consider what should be done in the future. Our experience over the past forty years has taught us that we are in continual danger of an emergency and that therefore we should consider how this country can keep prepared to defend itself *on a continuing basis*.

This country simply cannot afford to build up facilities for the production of military items, produce these items for a few years, and then discard and destroy the facilities at the end of that period. The amounts of money

Below, 421 tons of the Army's heaviest equipment including cross-country carriers, cargo vehicles, tank transporters, gun carriers, and an experimental heavy tank.

involved as well as the physical effort on such a basis are more than this country can stand.

Moreover, the billions of dollars' worth of machinery, tools, and facilities our Government has acquired constitutes a vast military asset. It may even be more valuable than the end items that have been produced by them and held in reserve for actual combat. The reserved end items are not only tremendously costly, but they can and probably will become obsolete in a relatively short time.

Cost Small

On the other hand, production facilities become obsolete at a much slower rate, and the cost of keeping them up to date is relatively small. We must devise a national plan for retaining these production facilities in such a manner that we can utilize them again with a minimum of confusion in case of an emergency and with considerable saving in the time required to attain initial production of the end item.

It must be a plan that is both practical, as far as the defense of our country is concerned and one that will involve a cost that our economy can stand.

When the subject was first proposed to the committee there seemed to be little appreciation on the part of the military representatives that the broad production base we were then building was anything but permanent. I pointed out that our supply contracts require the Government to give us instructions as to where to ship production facilities ninety days after completion of shipments on the supply contract and that, further, if the Government wishes us to do so, we will enter an agreement to retain these facilities for another six months at Government expense.

But even nine months is a very short time to develop, explain, and have accepted, a plan which is national in scope and which requires the appropriation of money by the Congress. The initial objections dealt mostly with cost. The opinion of those present varied all the way from a cost of some tens of millions of dollars per year to a billion dollars for retaining facilities in the hands of the contractor.

In order to develop the economics of the problem the Munitions Board has asked about twenty contractors to study this proposal and develop estimates of the costs of such a program. At the same time the Board requested the three military services to submit lists of privately owned key plants which were essential to a defense program.

The data submitted indicates that there are about 916 privately owned key plants with Government-owned machinery and equipment in them. Three hundred and thirty of these have facilities costing over a million dollars.

The data collected from industry, when averaged over the twenty-two plants surveyed, indicates that: annual storage will cost 1 per cent of the Government investment; annual maintenance, 0.2 per cent; long-term layaway and removal to storage, 3.7 per cent; preparation for shipment to Government warehouses and loading on cars, 4.8 per cent; charge per square foot for storage area, $1.25. Applying these percentages to $2 billion, approximately the value of the Government-owned facilities in the key plants of private industry, we get the following estimates of cost for various phases of the layaway problem:

"We need a plan for retaining and preserving the facilities we now have built up . . . and preserving them in such a manner as to insure having them always available for use in the shortest reasonable time consistent with cost."

Annual storage, $20 million; annual maintenance, $4 million; preparation for long-term storage and removal to storage, $74 million; cost the first year, $98 million; cost each year thereafter with no further movement, $24 million.

If industry is directed to ship the facilities to Government warehouses, it must prepare them for extended storage according to Government specifications. These require that machinery be dismantled in many cases; cleaned; gears, shafts, and bearings flushed with rust-inhibiting oils or preservatives; packed, skidded, and loaded on freight cars.

The cost of doing this is very high. The average of the estimates from these twenty-two plants was 4.8 per cent of the invested dollars. The large facilities estimated this at near 6 per cent which appears to be the better estimate to use.

The savings to be realized by shoving the machinery to one side or to a warehouse on the site, compared with the cost of preparation and shipment to Government warehouses, would pay for the rent on the site for approximately five years.

Remember that the figure I have quoted does not include the cost of freight and unloading into the Government warehouse. Remember, too, that the value of many facilities, such as furnaces and plating equipment, is practically all lost when the equipment is moved.

These data are based on quick estimates in twenty-two plants, large and small. I think the estimates for preparation for storage and removal to storage at the site are high, and the estimates for storage and maintenance low.

However, even if the cost should prove to be twice as high as here indicated, it would still be very low considering the national-defense objectives to be achieved.

Aware of Problem

We find from these surveys that management is well aware of the problem of national defense and desires to coöperate in such a program. From a purely commercial point of view this would not ordinarily be desirable. Therefore it seems important to develop a national program at this time when the need for continuing defense is apparent to every one and when many of the problems, as well as the cost of preparing for military production, are fresh in the minds of every one.

At the risk of repeating my former

remarks, I emphasize that such a program as is here contemplated cannot be formulated and put into effect in a short time.

May Be Too Late

If we wait until supply contracts are completed, it may be too late to formulate and get a program into effect before the Government would be forced to accept machinery and equipment from their contractors, and the great productive capacity which we are now building up might be partially or almost completely lost. The problem is an urgent one. There is another very important reason for retaining the facilities for military production in the hands of the contractor who is making an end item or principal component. It concerns the development and improvement of our present weapons and the development of new ones.

To accomplish this it is highly desirable that the contractor employ competent engineering talent continuously on the problem of developing improvements and eliminating weaknesses.

There has been almost a total lack of coördination between research and development personnel and the contractor who has to make the product. We think that in many cases the contractor should be authorized to set up a minimum number of machine tools for the purpose of manufacturing, at regular intervals, small quantities of improved end items for test and evaluation.

Many Advantages

This we generally call a "pilot line." There are many advantages to such a program, and I would like to list some of them:

1. It would develop more effective weapons.

2. Private industry would be enabled to keep informed regarding the changes in weapons, the obsolescence of old and the development of new ones.

3. The contractor could develop better production processes, tools, and machinery to produce the weapons. This contemplates that the Government will supply funds for the purchase of new machine tools and special tools during the life of the contract.

Above, a 2½-ton cross-country carrier, one of many military developmental vehicles.

4. It would reduce the cost of the weapons by the use of materials in ample supply and use less costly materials, lesser amounts of raw materials, and materials better suited to the weapon.

5. It would enable the contractor, when developing improved designs, to get these designs in shape for quantity production by the employment of engineering personnel on a continuing project basis.

6. It would provide the using services of the armed forces with new models for use, test, and evaluation in field maneuvers to determine the worth of changes made and to suggest other improvements to be developed.

7. The retention of a certain amount of "know-how" within the manufacturing establishment would be insured.

8. The contractor and the contracting officer would be enabled to know more accurately the costs involved in a supply contract for quantity production of the weapons and the cost of facilities, tools, and equipment for their production. This would lessen the problems of both in formulating a contract.

9. The over-all planning of the Joint Chiefs of Staff and the Defense Department could be facilitated by the use of data developed in pilot-line operation.

10. The machine-tool industry would be kept in healthier condition if funds were provided for the purchase and construction of machinery and tools better suited to the manufacture of the product, or needed for the manufacture of modified and newly designed parts.

Time Increased

The time element involved in the production of machinery is greatly increased by the time required to design tools and fixtures to go on the machine tool and to design changes in the machine tool to make it suitable for machining the parts assigned to it.

The time required to produce machine tools would be considerably reduced in times of national emergency if the engineering work had already been done for pilot-line operation.

The plan formulated should be sufficiently flexible to permit application to individual cases. It should not be assumed that the suggested plan is all-inclusive and that no equipment would be shipped to Government warehouses.

Problem Is Important

Undoubtedly this would be the practical thing to do in many cases. I urge that the exceptions that can be thought up be not allowed to obscure the merits of the ideas suggested, and wish to emphasize again that the problem is timely and exceedingly important.

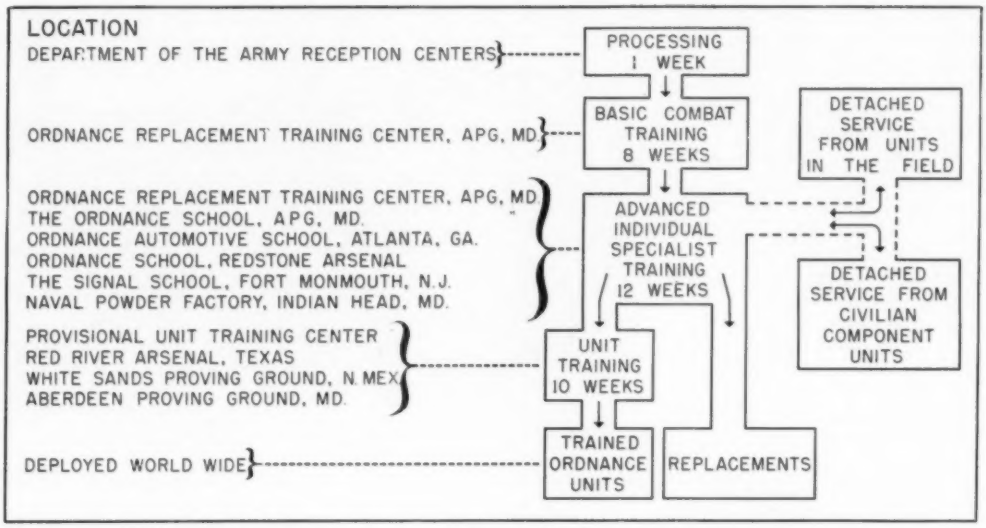


Chart showing flow of enlisted men through the Ordnance training system.

The Ordnance Training Command

Unique System Develops Skilled Technicians

Everett C. Schroder, Jr.

PERHAPS on some distant day our rapidly advancing civilization will discover a method to replace fallible humanity with some infallible mechanism. Until that time, however, we must rely upon the individual, despite his frailties and inadequacies, to give meaning to our scientific and industrial advance.

Individual Training

It is within this area of individual training where "the best laid schemes o' mice an' men gang aft agley" that the Ordnance Training Command performs its mission.

Engrossed as we are in the research and development, procurement, maintenance, and supply of equipment of great value, volume, and intricacy, it is little wonder that our perspective becomes distorted and the individual Ordnanceman becomes another element in a complex mechanism rather than the inventor, operator, and reason of the machine.

It is safe to assume that without the individual doughboy to use effectively the superior equipment provided, our inventiveness and mass-production capabilities would be for naught. And without the Ordnance soldier in the field to maintain and supply this superior equipment, the resourcefulness and skill of our infantrymen would be for little.

Firepower and Mobility

Superiority of firepower and mobility is the shibboleth of the American Army. The research and development, industrial, and field service activities of the Ordnance Corps in insuring that this superiority is maintained and increased are well known. The contributions of the Ordnance training system are perhaps less familiar.

Gen. John R. Hodge, Chief of Army Field Forces, has stated: "The objective of all training is to teach and condition a man to perform effectively as an individual and as a member of a fighting team in combat with a view to enhancing his chances of survival on the battlefield."

Technical Missions

Within this over-all objective the Ordnance Corps training system must prepare these same individuals and teams to perform their technical missions in the maintenance and supply of ordnance equipment.

With well-developed facilities and an adequate supply of skilled manpower, both civilian and military, the task of providing ordnance service within the United States is much simplified. Visualize, however, this fast-moving, hard-hitting Army of today operating in areas thousands of miles from the United States without the benefit of

our transportation network, skilled labor supply, and highly developed industrial facilities.

While still traveling on its stomach, today's Army also travels on a great number of wheels. While the individual marksman still provides the nucleus of the fighting units, there is a tremendous quantity of rapid-firing large caliber weapons that support him in his mission.

For Use on Enemy

The arms and devices designed and produced by American industry to assure our fighting soldiers the most advanced and best possible equipment serve their purpose only when they are brought to bear upon the enemy in first-class functioning condition.

Here, then, lies the primary task of the Ordnance training system: to provide units composed of skilled technicians and well-trained fighting men capable of rendering efficient maintenance and supply support of ordnance equipment during sustained combat operations in the field.

The training of fighting men has evolved over a long period of time in increasingly complicated procedures. If we are to believe our mythology, perhaps the simplest way devised was the one practiced by Cadmus. This process involved merely the slaying of a dragon and the sowing of its teeth in a furrow.

According to the tale, scarcely had the teeth been sown when the clods began to move and the points of spears began to appear above the surface. Next, helmets with their nodding plumes came up, and next the shoulders and breasts and limbs of men with weapons, and in time a harvest of warriors.

None would deny the complexities in producing soldiers that have arisen since the method used by Cadmus.

As a parallel to this oversimplification, let us trace the creation of a typical Ordnance unit—the Ordnance Field Maintenance Company. This unit has as its mission the full field maintenance support for 2,000 general-purpose wheeled vehicles and 10,500 small arms.

This includes, in addition to repair and maintenance, the obtaining, storage, and issue of all ordnance supplies needed for the maintenance operation as well as for the resupply of ordnance equipment to using units.

Adhering to the principle that Ordnance soldiers must be first-class fighting men, the individuals comprising the unit must be trained in the basic military skills which enable them to perform effectively as individuals and as members of a fighting team in combat.

Thus the newly inducted Ordnance soldier is sent to the Ordnance Replacement Training Center at Aberdeen Proving Ground, Md., where, during his first eight weeks of training, he is physically and mentally conditioned for the art of war.

He receives instruction in the proper use and care of his individual weapon and a familiarization with other weapons that he may be called upon to use in combat. He learns how to live in the field under all conditions and how to close with the enemy and effectively destroy him.

Fighting Man

These first eight weeks are directed toward producing the well-trained fighting man, but he is not yet prepared to take his place in an Ordnance unit where he will also be required to perform as a technician.

Within the Ordnance Field Maintenance Company are found, among others, such diversified artisans as automotive fuel and electrical repairmen, wheeled-vehicle repairmen, metal-body repairmen, machinists, small-arms repairmen, welders, blacksmiths, and watch repairmen.

Each of these positions as well as each position in every Ordnance unit has been carefully reviewed to determine exactly the scope and function of each job. Based upon these established specifications, a program of instruction has been designed for fifty-four different training courses to be taught within the Ordnance training system.

Mr. Schroder is chief of the Plans Branch of the Ordnance Training Command, Aberdeen Proving Ground, Md.

The individual having been selected for one of these courses based upon his previously determined aptitudes is afforded training through facilities comparable to the finest civilian vocational institutions.

Expert military and civilian instructors employ carefully planned lectures, textbooks, and training aids to impart the necessary theoretical knowledge to the student. Well-equipped shops afford facilities for practical application using tools and equipment that will be available to the soldier when he joins his unit.

At selected Ordnance installations officers and noncommissioned officers of the cadre, usually individuals who have been members of a similar type unit, are awaiting the arrival of the soldier technician in order to begin the creation of a closely knit, smoothly operating Ordnance Field Maintenance Company.

During this unit training period of approximately ten weeks, the soldier is assimilated into his unit so that he becomes a part of the team whose welfare he learns to place above his own. Individuals are welded into sections and platoons, each with a clearly defined maintenance or supply mission.

Thus, in an average length of thirty weeks from the time of his induction, the Ordnance soldier has become an integral part of an organization designed to carry Ordnance service to the units in the field.

Replacement

At the same time that this typical Ordnance unit is being prepared to take its place in the field, other Ordnance units already committed to an operational mission must be resupplied with newly trained individuals to replace those who, having fulfilled their military obligations, are being returned to civilian life.

The job of training today's Army during a partial mobilization is proceeding in a situation that has no exact precedent. During this year it is estimated that the Army will lose ap-

proximately one-half of its trained men; or stated in another way, approximately three-quarters of a million new men will require training.

Consequently, at the same time that the potential member of the new Ordnance Field Maintenance Company is undergoing basic combat training at the Ordnance Replacement Training Center or his specialist training in an Ordnance technical course, a fellow soldier is undergoing the same training as a replacement for another Ordnance unit already in operation.

Many Skills Required

Among the various skills taught by the Ordnance training system, many are required by other branches of the Army. In order to achieve maximum economy and centralization of effort, the Ordnance Corps therefore trains the total Department of the Army requirement for these skills regardless of their ultimate assignment.

Consequently, in addition to the individuals previously discussed who will become fillers for newly activated Ordnance units or replacements for individuals in units already in being, a considerable portion of the Ordnance Corps training load is comprised of requirements for other branches of the Department of the Army.

A natural extension of this centralization of training for identical skills regardless of assignment is the inclusion of Department of Defense requirements, and frequently within Ordnance Corps training courses there may be found Marines, sailors, and airmen. The normal flow of enlisted men through the Ordnance training system is indicated in the chart on page 922.

Training Varied

In order to visualize the officer-training program, let us examine the various types of training that may be administered to a typical Ordnance officer who joins the Corps after commission as a second lieutenant from an Ordnance unit in the R.O.T.C.

This officer may first attend an Ordnance company-grade officer course which will provide basic branch training so that he may have a working knowledge of the duties and responsibilities appropriate to company-grade Ordnance Corps officers.

At the conclusion of this course, such officers may be enrolled in courses in the field of armament maintenance, automotive maintenance, Ordnance general supply, ammunition supply, or fire-control matériel maintenance.

After a period of varied assignments within the Ordnance Corps, the officer may again be returned to training in the Ordnance officer advanced course which provides advanced branch training in order to ground the individual thoroughly in the duties and responsibilities appropriate to field-grade Ordnance Corps officers.

Dependent upon future assignments of the officer, later in his career he may go to other Department of the Army schools such as the Command and General Staff Officer School or the Army War College or he may be given advanced academic or technological training in a civilian university.

Helped by Industry

Many Ordnance officers have received invaluable training through the coöperation of industry. Such officers receive on-the-job training in industrial operations closely allied to or supplementing Ordnance Corps activities.

The primary elements of training program management are program development, program execution, and program review and analysis. In an effort to centralize these functions in a field operating agency, the Chief of Ordnance established the Ordnance Training Command at Aberdeen Proving Ground on October 18, 1950.

Development of the training program involves the determination of quantities of individuals and units to be trained, the selection of training sites, and the planning for necessary supporting facilities, funds, and personnel to accomplish the proposed program.

Program execution is performed by various Ordnance Corps training agencies. Detailed training schedules indicating planned inputs, outputs, and training load for each of the training courses is an integral part of the program execution.

Training programs, programs of instruction, lesson plans, texts, and training aids must be continuously prepared, reviewed, and analyzed to insure that Department of the Army and Ordnance Corps policy and doctrine are properly reflected.

Concurrent with and subsequent to the program execution, constant review and analysis are exercised in order to coördinate the activities of the various Ordnance Corps training agencies and to insure that the projected program is realized both efficiently and economically and within the required time limitations.

Gains Plotted

The progress of accomplishment is carefully plotted in order that areas requiring acceleration or emphasis may be afforded prompt attention.

The Ordnance training system, aware of the necessity for an effective and well-prepared civilian-component program, affords many opportunities for training of individuals and units. Both officers and enlisted men may be enrolled in resident training courses during periods of active-duty training. For those unable to obtain resident instruction, comparable extension courses are available.

During the past 2-year twilight period of partial mobilization, the Ordnance training system has produced units and individuals capable of supporting the activities of our Army in its global mission. The limited-service period of our citizen-soldiers has made it imperative to provide trained personnel, most of them skilled as specialists, in the least possible time.

Pool Enlarged

In the process of creating the required number of Ordnance units, and in the recurring process of providing replacements for those whose term of service expires, the Ordnance Corps has met not only the commitments of the active Army establishment, but has steadily enlarged the pool of trained individuals in our civilian components to be available in the event of full mobilization.

JAMES L. WALSH
President, American Ordnance Association, 1947-1952
Founder and first editor of this Journal, 1920.

THE OFFICERS AND DIRECTORS OF THE AMERICAN ORDNANCE ASSOCIATION

Announce the Annual

James L. Walsh Prize Essay Contest

for a Prize of One Thousand Dollars

Open to all members of the Association who, at closing date for entries, have not reached their thirtieth birthday.

SUBJECT OF THE 1953 PRIZE ESSAY WILL BE ANNOUNCED JULY 1, 1953, IN THIS JOURNAL.

Contest Will Close November 1, 1953

Award will be presented at the Thirty-fifth Annual Industrial Preparedness Dinner Meeting of the Association at the Waldorf-Astoria, New York, December 2, 1953

Detailed information for prospective contestants will be available after July 1, 1953, upon application to the Editorial Offices, American Ordnance Association, Mills Building, Washington 6, D. C.

Under observation by Communist forces, Ordnancemen of the U. S. 3rd Infantry Division lift and repair the motor of an M46 combat tank in Korea (Army photo).

Field Service with the Troops

Ordnance Strives for "Service to the Line, on the Line"

Mark S. Watson

LAST April Gen. James A. Van Fleet, then commanding the Eighth Army in Korea, remarked that "the Eighth Army is stronger than at any time in the twenty-one months it has been in Korea. We have had beautiful support from Ordnance in weapons, ammunition, and transport. Nothing the enemy can bring into South Korea can hurt the Eighth Army."

Heartwarming Praise

This—with allowance for the fact that the Chinese in their ensuing frenzied assaults would cause us losses of personnel and very large (and sometimes disturbingly large) use of matériel—was heartwarming praise from a well-informed authority, and it is immensely gratifying to know that, in the pay-off performance of our front-line units, Ordnance fulfilled high expectations.

There is no present need for readers of these pages to rehearse the familiar story of the research and development, and the planning, production, and procurement work by which Ordnance's highly successful weapons and equipment first come into being; nor to do more than refer to the earlier article (ORDNANCE, January-February 1953, p. 607) for discussion of the Stateside work of the Field Service Division of the Ordnance Corps. The fullest narrative account of all this work as performed in World War II is still "The Industry-Ordnance Team," written by Lieut. Gen. Levin H. Campbell.

In an earlier article (ORDNANCE, January-February 1953, p. 607) the Field Service Division of Army Ordnance was discussed, structurally and functionally, to indicate in broad outline how the 400,000 items in the Ordnance catalog (once they are procured via the Industrial Division) move forward through the Corps' admirably organized depot and stock-control system, with needed maintenance and renovation and packaging, on their way to the troops.

The movement there described ceases at the ports (in the case of ordnance for overseas) and at the army depots (in the case of supply for troops in any of the six army areas of continental United States). The first article dealt with field service *for* the troops; the present article treats of field service *with* the troops.

Responsibility Remains

But the Ordnance Corps' responsibility for a 2½-ton truck, for example, does not cease when that vehicle rolls across the pier in San Francisco Bay and into the hold of a Korea-bound cargo vessel.

The Ordnance Corps organizes supply and maintenance work *with* the troops as well as *for* them. No longer, to be sure, does the chain of command in the field—as in the depot system at home—reach up from the Ordnance company through battalion and regiment and so on to the Chief of Ordnance in Washington. It necessarily goes, rather, to the theater commander himself who must do the commanding of all the elements in his area.

Thus the Ordnance battalion within

the division is as much a divisional element as is one of the infantry units. The army corps commander has on his staff an Ordnance Officer to advise him, and particularly to watch over all technical matters within the corps affecting ordnance, but that busy officer exercises no command powers whatever. Likewise the army commander has an Ordnance Officer who has *operational control* of all the Ordnance units in that army, other than the organic divisional units, but again this most decidedly is not *command*.

Strictly Staff Work

It must seem to the outsider very much like it, because for efficiency's sake the Ordnance Officer habitually directs the units' movements and procedures in a manner suggestive of command, but this is strictly staff work and is quite free from the command responsibility—which is a very good thing from his viewpoint, too, for he thus can devote himself wholly to those technical matters in which he is, or should be, far better trained than any one else in sight.

The reader will recall that the basis of the supply system in continental United States is a combination of retail and wholesale elements, carefully divided for expediting service, but ingeniously integrated by the control-point system and guided by a regulating office.

The Ordnance Section

To summarize, the using troops' sole contact is with the post, camp, and station Ordnance section which deals with the distribution depot ("retail"). If the desired item is not there or in a near-by back-up depot on a ready basis, the distribution depot gets it forthwith from the appropriate key depot ("wholesale") or by stock-control's skillful methods from still farther back in the production-procurement line.

On the basis of experience's teachings something closely akin to this has been developed in the overseas theater whereby the using troops' contact again is with the nearest source of supply and maintenance. If that source lacks the item, it forthwith gets it. To effect the required delivery it often is necessary to send a disabled piece of equipment back through other echelons for major repairs (instead of bringing a missing item up forward to a meeting place, as in other cases), but that is something for which the Field Service system is set up and which it does methodically in the manner so gratifyingly indicated by General Van Fleet.

One may think of the overseas theater's maintenance and supply work at three grand levels:

1. Farthest to the rear is depot maintenance and supply, which is very much like a zone of interior system (distribution and key depots and several other things combined) transplanted to the operations theater in the form of a base depot with vast resources for wholesale storage and complete rebuild.

2. Field maintenance and supply, which performs or guides all Ordnance operations below the depot level and above the using troops' level.

3. Organizational maintenance and supply, which is performed by the using troops' organization (that is, by battalion, company, or battery personnel).

One can offer as a suggestive illustration the case of the privately owned motor car here at home in need of attention. If it is a case of mere tire puncture on a holiday trip, the car owner himself can shift to his spare (unless he is forehanded enough to have brought a strong-backed passenger along with him).

If it is a patching job or a spark-plug replacement, he can get it done at the first filling station. If the ailment is more serious, a roadside garage will provide the cure.

If it still is a sick car, the manufacturer's agency resources are called on. And so on, all the way to a major rebuilding.

Mr. Watson is a well-known military analyst and holder of the 1945 Pulitzer Prize for international correspondence. At present, he is a member of the staff of the Baltimore *Sun*.

The maintenance or repair of a 2½-ton Army truck in the theater of operations is somewhat on the same pattern—except that filling stations are not so numerous, and the highway not so good for pushing, and the vicinity likely to be noisier and more disheveled and full of flying metal, and the customer is in a real hurry this time and no foolin'.

Can Make Repairs

Those exceptions aside, the driver of our six-wheeler fortunately is likely to know more about his vehicle than does our home-town Sunday driver, and he is able to make a lot of quick repairs himself.

He is part of what we may call the first echelon in organizational maintenance and supply (Item 3 in the above listing). The rest of that echelon is the so-called preventive-maintenance work, such as lubricating and cleaning, in which all Army drivers (and the using troops) are being trained by Field Service contact teams, of which very useful activity more will be said later.

The second echelon is still within the using troops' organizational maintenance and supply. It can provide, say, the fan belts and spark plugs and other stock-room items which manifestly even the most farsighted driver cannot tuck into his tool chest or under the seat, and it can accomplish somewhat more complicated repairs than the driver can handle. These two echelons compose organizational maintenance and supply.

Field Maintenance

Field maintenance and supply is next in line and is composed of the third and fourth echelons. It does everything which that 2½-ton truck (and all the rest of Ordnance's end products, except ammunition) can call for, short of jobs so big that they require fifth-echelon attention. In the case of Korea, the fifth echelon is back in Japan, to which the really fundamental rebuilding jobs have to go. Under the guidance of Brig. Gen. Gerson K. Heiss, Ordnance Officer, U. S. Army Forces, Far East, that echelon is performing tasks never before undertaken in an overseas theater.

Where are the third- and fourth-echelon jobs performed? And how?

We will come to that as soon as they are satisfactorily defined, and that is quickly done. The third echelon provides *direct support*. This is supply and repair work provided directly for the using troops.

To revert to the comparison with the Stateside operation, it is one of the functions of the post, camp, and station Ordnance section; or, to revert to our out-of-luck Sunday driver, it is such repair and supply work as the automobile shop at home affords him when he has his car hauled in for a sizable repair job, on completion of which he can go back a little later to pick up his restored vehicle for the next Sunday's bout on the highway.

Heavy Support

The fourth echelon does a more involved job than the third, beyond the customer-return basis, and is known as *heavy support*. It very definitely calls for action on a stock-depot basis, and it has two working levels—actually three or more companies, organizationally, in a typical battalion as follows:

1. The Field Supply Company. This is really a mobile depot carrying replacement parts most frequently called for and most readily installed. It provides spare parts for the third echelon to install.

2. The Heavy Maintenance Company (for other than automotive work). It has its own shop equipment, of a much less mobile character, with which to do the heavy work which simply cannot be done farther forward.

3. The Heavy Automotive Company. It does for wheeled vehicles everything which the preceding element does for other Ordnance equipment. It carries its own field-supply unit and its own recovery unit.

4. The Recovery Company (for tanks and tracked vehicles) whose powerful tractor (not nearly so numerous or so powerful, one must interject, as our medium tanks call for) goes far forward in the battle zone to pick up totally disabled guns and tanks and trucks littering the area after combat and to haul them back to a quieter area for any major replacements or repairs.

The foregoing sketches the basic division of Field Service activities, in the realm of general supply and maintenance in the theater of operations. Further, it sketches pretty well (with some obvious adjustments) the corresponding division of these labors within the areas of posts, camps, and stations in the zone of the interior.

Returning to Korea, what is the distribution of responsibility for all this work? Naturally it is comparable to that of any other supply activity, all being carefully divided, from rear to front, among army, corps, and divisional zones.

The divisional zone activities farthest forward are generally limited to first, second, and third echelons—necessarily so in a time of hot combat, because large installations for supply or repair are extremely vulnerable to the enemy's bombing or artillery attacks.

The first and second echelon activities are performed by the using units. The third echelon's divisional activities used to be performed by a divisional Ordnance company; now they engage a 2-company battalion, and not merely because today there is far more ordnance per division than in World War I. It is infinitely desirable (and today it is often possible by reason of mobile repair shops) to keep a gun or a truck or a tank working at its maximum with the division rather than to suffer the delay involved in hauling it out, repairing it, and hauling it back.

Useful When Operating

A weapon or vehicle is useful when it is operating—and at no other time. So a stupendous effort is made to keep it working and, once it is disabled, to get it back to work in minimum time.

That points to a significant Ordnance development—or perhaps intensification is the word—of recent years, made possible in its present full measure only by the enormous mobility which our modern vehicles possess. There has been reference already to the present third-echelon concept. That echelon is not exclusively the realm of the divisional Ordnance Officer, but a very large part of its activity takes place in his zone, as mentioned.

For Field Service is so set up as to carry maintenance and supply work just as far forward as possible (and that is much farther forward than was common a few years ago) for the exact purpose of keeping all our weapons and equipment in operation all the time.

Supplies Third Echelon

Thus, too, the fourth echelon's Field Supply Company (previously identified as a mobile depot) is able to supply the third echelon with parts and major assemblies which the third echelon itself would not be warranted in stocking. Yet, thus supplied, that echelon can go straight to the using troops and restore a great deal of crippled equipment to operating condition.

If the third echelon's work is to replace a dead engine bodily with a new one, the fourth's is to get that original dead engine and repair it and return it to the third for the next needy tank or truck. Or if the job of resuscitation is too great, but the engine is salvageable at all, back it goes to the fifth echelon in Japan for total rebuilding and return.

What has been done since 1948 to restore 65,000 out-of-service vehicles of World War II to full utility in Korea was graphically recounted in this magazine by Brig. Gen. Gerson K. Heiss in the September-October and November-December 1951 and the January-February 1952 issues.

The aim is the preservation of both firepower and mobility. Those two qualities in combination can make a small army as effective as a large one; brains can still conquer bulk.

How is this done, specifically? In the forward area our Ordnance people do not have the time which is available to their civilian counterparts at home, and they certainly cannot set up shops at busy corners to attract customers. Yet they do actively seek business, and sometimes they dazzle the "customer" by their persistence in reaching forward from the direct-support level.

To this end have been organized the "contact teams" previously referred to, or the "instructor-inspector service" if

you prefer that term. Its members operate a new model truck which has a large assortment of supply parts (whether going to a gun battery or a transport unit) plus tools for on-the-spot repairs, plus personnel (and this is the key) who know thoroughly the qualities and deficiencies of every weapon and every piece of equipment in the unit they are to visit.

They do not stop with repairing or replacing crippled items—they talk with the using personnel, find out what happened, and explain why it happened. They usually are able to show the using personnel a better method of doing that personnel's own job or of caring for equipment so as to result in less breakage or smoother performance.

This sort of battlefield reëducation of combat men in the use of costly and sometimes delicate equipment has been the dream of Ordnancemen for generations. It was realized to some extent during World War II, and it received a marked boost in Korea when Brig. Gen. Urban Niblo as Far East Command Ordnance Officer (he now is at Army Field Forces) transferred his World War II European experience in that field to the Far East and contributed enormously to the instructor-inspector enterprise.

Typical Setup

The typical setup at an army headquarters comprises two Ordnance groups of, say, four battalions, one of which is known as the Direct Support Group, one of whose battalions is at each of the three corps areas while the fourth supports the army's own units and also operates the recovery company for the entire army sector.

The battalion with each of the three corps has a direct-support company which does work comparable to that of the divisional Ordnance company in that field but which probably gets a heavier load in the form of overflow jobs from the several front-line divisions. There also is a separate third-echelon element solidly made up for direct support to troops as required by varying developments.

The other or Heavy Support Group composes a fourth echelon whose composition is worth examining. One of its battalions is wholly concerned with supply work for the Ordnance units in the army area.

Another battalion (sometimes two) is a heavy maintenance unit performing overflow work for the overburdened third echelon. It is less mobile than the lower echelon, which means that it can be, and is, equipped with tools and personnel to do a greater degree of repair work and with greater storage facilities with which it can provide more supply parts in greater variety.

Depots Kept Mobile

It may well run four or more depots, one for units in the army rear area and the others for units in the corps area—all of these depots being as mobile as the field situation requires.

Invaluable as have been many of the Army's post-1945 developments designed for immediate application in time of war, the onset of an emergency always demonstrates how unpredictable emergencies are. General Heiss and Lieut. Col. John H. Hempel, his operations chief, note simply that the forms carefully worked out for zone of communications work, in Japan at least, had to be largely abandoned.

When one is far from home and in a hurry, he finds that he can help himself a good deal. The 229th Ordnance Base Depot was fortunate in having men capable of helping themselves and also in having in Japan the remains of a wartime industry, plus cheap labor.

Under the Ordnance Officer, Far East Command, are the conventional divisions—Industrial, Maintenance and Supply, Ammunition, and Operations (this last supervising the instructor-inspector work in addition to its more familiar duties). Under the 229th Depot (General Supply) are the Tokyo Ordnance Depot (all armament depots, guns and parts, and maintenance), the Yokohama Ordnance Depot (all automotive supply, but *no* maintenance), the Fuchu Ordnance Depot (rebuild of 4-ton motors and up, with two subdepots for rebuild and storage), the Tokyo Engineering Works (production-line rebuild of major assemblies of ¼- to 2½-ton vehicles), and the Oppama Ordnance Shops (for teardown and rebuild of such vehicles).

The 229th Ordnance Depot's ammunition branch has five major depots and eight subdepots, mostly old Japanese dumps scattered through the islands for convenience of storage and receipt and issue.

New Units for New Jobs

There are no standard T/O & E units in Japan, simply because they would not fit precisely into requirements, none being designed for exactly this purpose. Instead General Heiss and his establishment, like their predecessors, have tailored new units to fit the jobs.

Below, Ordnance teams use a tank wrecker and a 15-ton tank-retriever tractor to rescue an M4 tank mired in the mud of a rice paddy in Korea (Army photo).

Thus, in the realm of heavy support, when the troops went into Korea it was with one depot company to a division. It was too thin a dilution and too great a strain on supply, so that arbitrarily all these companies were pulled out and combined into battalion units so as to put the control in one spot (comparable to the stock-control points at home).

It resulted in the remarkable improvement of availability previously noted, doubling the supply, in effect, without increasing at all the actual number of items.

Back in 1950, we must remember, the Eighth Army Ordnance technical service was set up for four thin divisions on peacetime duty. There were five installations, civilian controlled and all independent, designed for Operation Roll-Up. There were two supply depots requisitioning direct from home, making seven such chains.

Ordnance set up a stock-control agency—with no business machines to be sure, but with 500 alert Japanese doing their best to assemble the data manually—so that Ordnance could push the needed shipments to Korea while gathering an inventory in Japan.

Not Inventoried

Thousands of tons went into Korea in multipack form, uninventoried for months until it was possible to break open those packages to verify their contents. The next year, 1951, brought the computing machines and also Project 170 for finding out what the Ordnance Base Depot really had. The war was nearly eighteen months old before full control and inventory were firmly established.

The numbers simplification, we know at home, is a boon to supply work. But a change in numbers at the rear, however admirable, is of no use up front until it can go into effect there, too. That is not done easily in a theater where the establishment is lightly geared for turning out supply officers and, necessarily, heavily geared for developing maintenance officers.

The numbers-changing is too complex a problem for present discussion, but it must be recognized, now or at any other time, as a harassing task for Ordnance. One still hears rueful mention that a single depot in the United States put into effect 6,000 changes for Field Service to wrestle with. The Far East method was to take a certain block of numbers and publish it, as a block, all the way to the forwardmost units, then to take the next block and handle it likewise in an effort to keep all change publications current.

But, as a result of those first eighteen months, an earnest recommendation from the Far East is that hereafter every new Ordnance officer get a solid training in supply work—which causes

---

"It is infinitely desirable . . . to keep a gun or a truck or a tank working at its maximum with the division rather than to suffer the delay involved in hauling it out, repairing it, and hauling it back."

---

ninety per cent of the headaches against a mere ten per cent caused by maintenance worries.

Project 170 and the prefabricated stock cards make for the best system ever developed but, after all, a system does not think; supply officers must still do that, and the too-rapid rotation of trained individual officers has obviously reduced efficiency from the high point of last year.

There is a conscious effort to set up in the Far East a system which will be useful not only for Korea but for a larger war of movement when a division simply cannot move 6,000 tons of supply—such as some of them brought in. With supply cut to 600 tons within the division train, it is possible to move, and it is easier to find the needed items, too.

Record Deadline

In the Eighth Army, Ordnance has set up a record with a "deadline" (in this case, immobilized vehicles waiting for a replacement part) of only three per cent for six months at a time. That is better than one will often see at home.

This is the first time in history that Army Ordnance on a foreign shore has been set up for complete rebuild of vehicles, good as new. It is an added marvel that, thanks to low-priced labor, this rebuild is much cheaper than it would be at home as well as very much faster, shipping considered. It calls for very careful scheduling in the whole chain of teardown, assembly rebuild, and final assembly.

Long Planning

All included, planning must be done for nine months in advance, which is something to consider in the planning of field operations employing this equipment.

There is a consistent effort to have the field commanders, all the way up to field army, recognize their responsibility for preventive maintenance, and require each lower echelon to realize its importance to the extent of seeing that the user does the best he can with his equipment.

That has never ceased to be a need at all levels, but we are making the uncomfortable discovery that, while equipment is always changing, personnel does not uniformly adapt itself to the change.

At last one comes to the other great branch of Ordnance Field Service—that which provides ammunition, as distinguished from general supply and maintenance. In an army sector this is handled by another group, commanded (like the Direct and Heavy Support Groups) by a colonel, and equally responsive to the army Ordnance Officer.

The Ammunition Group, again, consists of several battalions, one for the army units and one for each of the component corps. Severally they operate the several ASP's (ammunition supply points) into which ammunition flows forward from the distant base and on to the using forces in the line.

The divisional Ordnance Officer keeps a watchful eye on the actual collection and distribution of ammunition within his unit. The physical task is performed by the company and battery command by means of ammuni-

Above, members of the Eighth Army's 30th Maintenance Company repair and check the engine of an M46 tank at Ordnance Headquarters, Taegu, Korea (Army photo).

tion parties using their units' own trucks to go up to their respective ASP's, call for their allotments, and take them forward to their units.

Different Problem

Ammunition is a very different problem from that of general supply, for while the latter is an eternal struggle with a vast variety of parts, the other is (in wartime) an eternal struggle with tonnage and volume rather than variety.

The drain is on transportation facilities all along the line, whether rail, water, road, air, or human back. Certainly there must be precision in all this, too, but at least with only 500 items there is no such complexity as in general supply.

There is worry enough over bulk and tonnage and with the mere matter of distribution from base to front line. Certainly you must have enough ammunition at the forward dumps, which are the only place where the using troops can get it in a hurry. But you cannot have too much there, lest it be spotted and destroyed by enemy shelling or bombing, or actually overrun by enemy assault.

Steady Flow Better

Moving a lot of it up at a time is not so useful as moving up the required amount in a steady flow and being able to increase that flow on very short notice when a new need arises.

Korea has inadequate railroads, and trucks must operate under adverse conditions of roads and weather, as the truck-maintenance shops will tell you without being asked. Too bad, to be sure, but the using troops do not ask for explanations—they prefer deliveries.

We at least can be grateful that, so far, air attacks on the routes have been few, and there can therefore be confident planning for each tactical possibility, involving preparation to thin out the forward ASP's if we are going to fall back, or to rush up more truckloads if an advance is in prospect.

Interesting Data

The articles by General Heiss previously cited afforded most interesting data on the work of Field Service in Japan during the period after 1945—the disposal of 6,000,000 tons of Japanese explosives (some retained for occupational use, some components extracted and diverted to Japan's peace economy, the rest dumped).

The Ordnance Ammunition Division in Japan did its own research for improvising means to cope with urgent Korean problems, such as the rapid production and supply of antipersonnel mines, or rifle grenades (phosphorous and flare types), of trip flares, of dynamite caps—all made in Japan to meet a demand which could not wait for deliveries from the United States.

There have been a great many other expedients, devised in the Far East under war's pressures, some by the troops themselves, some in the shops in Japan. Of those mentioned by General Heiss and Colonel Hempel and by Col. William P. Northcross of the Eighth Army, these may be mentioned:

Expedients Enumerated

1. A special grouser (better than that of World War II) to stop the sideslips of tanks on Korea's mountain roads; likewise a new type of chain which is efficient on ice as well as in snow.

2. A hasty alteration of the improved shell for 4.2-inch mortars. Its trouble was that the added-increments made it unusable in the old-type mortar, and they had to be removed. This is a temporary expedient as the new-type mortars are designed for the improved shells.

3. Use of the caliber .50 machine gun, with a 10-power scope mounting, for sniping at extreme ranges.

4. Devising of a "sled," made up of two railroad rails placed parallel, with the forward ends forged upward, to aid in the recovery of disabled tanks.

5. Another "stunt" in the form of a remade jeep, with extra-power engine at the rear, carrying a recoilless rifle and a machine gun and some extra protection—a sort of light-light tank, which certainly needs a lot more study and redesign before it passes the tests.

6. A field-made adjustment to the escape hatch of tanks.

7. Some experimental suggestions for overcoming weaknesses in basic construction of artillery pieces which in Korea's mountains were kept at maximum range and maximum elevation longer than the design contemplated. It is estimated that eighty per cent of normal artillery fire in Korea is at maximum position and maximum range; also that rapid fire goes far beyond the anticipated rate.

What has been the greatest improvement in Field Service techniques in Korea? Lieut. Col. M. G. Megica (now in the Planning and Management Branch of the Field Service Division, Office of the Chief of Ordnance) thinks that the outstanding betterment has been in control of the spare-parts supply, and his fourteen months' experience in logistics and ordnance duties in Korea qualify him to offer judgment.

Under the lively encouragement of Maj. Gen. E. L. Ford, Chief of Ordnance, and Brig. Gen. John Hinrichs, chief of the Field Service Division, he had a large rôle in pushing certain corps-wide reforms now under way—especially in the selective stocking of all depots.

Local Imbalances

In any war, despite the slogan of "the right item at the right place at the right time," the fact is that there always will be local shortages of some items and local oversupply of others. The latter condition is almost as troublesome as the first, for too many items are hard to move—and often actually impossible under war conditions—and hard to store, and hard to count, and hard to calculate on.

Yet the terror of having too little frequently leads to having too much. Repeatedly, Colonel Megica recalls from his own experience that divisions came into Korea with oversupply, and their direct support units as well. After long study it became clear to the Eighth Army Ordnance Section, of which he was deputy for maintenance and supply, that rarely used parts were causing most of the trouble.

The Eighth Army Ordnance Officer, first Col. Olaf Winningstad, and then Col. William H. Jaynes, therefore initiated a program to split apart (1) the items needed frequently or critically; (2) those needed not so often or not so much; (3) those rarely needed.

The idea, eagerly pursued by Ordnance personnel, was to move the first group up front, the second group farther back, and the third group out of overcrowded Korea altogether.

Project 170 of the Ordnance Board was installed in all Ordnance units in Korea. The system called for a new sort of record keeping on the reasoning that a supply system is as good as its records and no better.

Chiefly the new device called for "demand data" and recorded systematically the number of times each item was sought at each level of supply, thus determining the actual consumption rate at each level and eliminating stockage of "luxury" items. As a result there could be a much better planned stocking of parts, and a check lately made with Colonel Hempel showed that the number of different items carried by direct support companies, which used to number from 10,000 to 22,000, now has fallen to 4,000.

"There is a consistent effort to have the field commanders . . . recognize their responsibility for preventive maintenance and require each lower echelon to realize its importance to the extent of seeing that the user does the best he can with his equipment."

The field-depot range of 25,000 to 45,000 parts has dropped to 9,500. The Pusan Base Depot load of 72,000 parts has fallen to 24,000. This means fewer parts to store and move and count, and it allows hard-pressed personnel to give more energy to providing the using forces with the goods which are badly and frequently needed.

Penalty Entailed

This entails a penalty, to be sure, for sometimes and inevitably there is a call on the company for Rare Part No. 4,001, and it takes more time to get it from the field depot. And there is a call for Rarer Part No. 9,501 which now has to be brought up from Pusan.

But these troubles are vastly offset by the great gains in supplying the 4,000 and 9,500 often-needed items at greater speed. It is simply more efficient to echelon the parts in depth.

Supply effectiveness is measurable by the percentage of quick availabilities, whatever the form of calculating. By the particular measure used in this case, when the reform began, ready availability was running at forty-one per cent. After eight months it rose to a peak of eighty-one per cent.

That is good, relatively, and it seems to be good absolutely as well, for there are always factors to make the record look worse than it is.

For instance, if an anguished company commander calls for an item which is not on hand, and calls for it again the next day, and the next, and the next before he gets it, the record shows three failures, when there really was only one.

There never will be one hundred per cent availability at any point; or, if there should be, there would be trouble, for that very fact would rationally mean that the supply point was overstocked.

In the zone of the interior, obviously field service is much less exacting. Here, instead of the battalion grouping in Korea, ordnance needs of posts, camps, and stations are met by Ordnance *sections* of modest size.

Functionally they are a combination of direct and heavy support units, and they are manned primarily by civilians. Yet these units' work, after all, *is* maintenance and supply and it *does* include direct and heavy support, and there is every reason for economical and efficient habits to be developed on a small scale as on a large one, at any level and in any field. Hence the contact teams referred to are sent out through the zone of interior, too.

Variable Load

Also, there are particular ZI problems. For instance, the posts and stations carry a highly variable load. In the field such a situation would be promptly cared for by moving a company to the most efficient operating position. In the ZI it is not desirable to move civilian personnel and their families about the map so brusquely, and a little inefficiency in this respect has to be accepted, to avoid expensive turnover.

Each sort of Field Service has its troubles. Probably the labor of conquering the less exacting troubles at home builds up spiritual strength with which to conquer the urgent troubles later on.

At home or abroad there is one goal, and that is a satisfied customer. Also there is one way to reach the goal, and that, in the familiar Field Service phrase, is "Service to the line, on the line."

Month by Month: Highlights of the National Defense

Armed Forces Day

The American Ordnance Association has pledged wholehearted coöperation to the Department of Defense in plans for the fitting observance of Armed Forces Day on May 16th.

"Power for Peace" has been adopted as the slogan for this year's observance.

> *President Eisenhower proclaimed May 16th as Armed Forces Day, a day "devoted to paying special tribute to those whose constancy and courage constitute one of the bulwarks guarding the freedom of the Nation and the peace of the free world."*

Pointing out that the armed forces "are now engaged in combat against ruthless aggression and despotism which threaten to destroy the freedom that this Nation cherishes," the President invited the Governors of the States, territories, and possessions of the United States to provide for the celebration of Armed Forces Day in a manner designed to pay suitable honor to the members of the armed forces.

Parades, luncheons, dinners, balls, mass meetings, flyovers, exhibits, open houses at military and naval installations, and other special events are being scheduled throughout the Nation. Equipment of the type employed in Korea will be displayed and demonstrated where practical. Special religious observances are being arranged by service chaplains and local clergymen.

Defense Organization

In his last official statement as Secretary of Defense, Robert A. Lovett expressed the belief that the existing Defense Department organization, "in spite of its awkward rigidity, has met the heavy responsibilities growing out of the present national emergency with comparatively few failures."

> *Mr. Lovett's observations are regarded as particularly significant since he has been made a member of the Rockefeller Committee which is studying ways to improve the Defense Department structure.*

The Rockefeller group will report its recommendations to Secretary of Defense Charles E. Wilson about May 1st.

Mr. Lovett said that "administrative reforms can assist the progress of unification, but eventual success will depend on unity of purpose and on the confidence and teamwork established among the military departments and between them and the Office of the Secretary of Defense."

In his farewell report Mr. Lovett praised the services of military and civilian employees of the Department.

"As a group," he declared, "military and civilian personnel of the Department have rendered faithful service under difficult circumstances and often without receiving full recognition of their effort. They are serving their country with a high sense of duty and merit the Nation's full support."

Sarnoff Commission

The complete report of the Citizens Advisory Commission on Utilization of Manpower in the Armed Services, under the chairmanship of Brig. Gen. David Sarnoff, revealed that the Defense Department's organization of 5,200,000 military and civilian personnel could be safely reduced by a total of 500,000 persons (military and civilian) and accomplish an annual saving to the Government of as much as $5 billion.

> *According to General Sarnoff "these substantial savings could mean the difference between a balanced and an unbalanced national budget."*

In forwarding its report to the Secretary of Defense, the Commission included the following statement:

"This Commission shares the chairman's opinion that an over-all reduction of at least ten per cent in men, money, and matériel can be achieved in the operations of the Department of Defense, without diminishing the required combat effectiveness of our armed forces. We recommend this as a minimum target for the Secretary of Defense to set at this time and recognize that this reduction in manpower and money cannot be made overnight.

> *"Based on the present military program, this reduction would mean possible savings of at least 500,000 in civilian and military manpower, and $5 billion annually.*

"Of course such reductions could not be made if, for reasons beyond our control, the requirements of national defense called for expanding our present military program.

"Whatever its size may have to be, it is evident that if waste and unnecessary duplication are eliminated and if higher efficiency is obtained, it will take less men and cost less money to do the job."

The Sarnoff Commission pointed out that to secure greater economy and increased efficiency in the operations of our military establishment will require action that must begin at the levels where policies are made.

Supervision and control of operations must be strengthened at the higher levels if the policies are to be carried out effectively in practice at the lower levels.

Studies and observations convinced the Commission (Adm. Lewis L. Strauss dissenting) that unification of the armed services thus far has been achieved only in part. It must be extended much further if the benefits expected from unification are to be realized.

General Sarnoff has been appointed by Defense Secretary Wilson to membership on the Rockefeller Committee to study and make recommendations to him in regard to the best ways of improving the organization of the Defense Department.

MacArthur on Victory

In a short statement to the Association of Graduates at the Founders' Day dinner of the U. S. Military Academy, Gen. Douglas MacArthur underscored the concept that military strategy and tactics must always have victory as their goal. He pointed out that the tactics in one war are always deficient in the next but that the endless purpose remains immutable—victory.

"But, now," he said, "oblivious to the lessons of military history and the American tradition, a new concept has arisen from outside our ranks which tends to disavow victory as the combat objective and to advocate in its stead a new kind of tactic on which to base the battle.

> *"The result can be nothing but failure—nothing to repay the terrible human sacrifice of war.*

"We of the military shall always do what we are told to do. But, if this Nation is to survive, we must trust the soldier once our statesmen fail to preserve the peace. We must regain our faith in those lessons and traditions which have always sustained our victorious march through the military perils which have beset our past.

> *"We must recapture the will and the determination to win, come what may, once American arms have been committed to battle. We must reject the counsels of fear which strange and alien doctrines are attempting to force upon us.*

"We must proclaim again and again and again an invincible adherence to the proposition that in war there can be no substitute for victory."

Marksmanship

The Army's rifle-qualification courses have been revised and are being put into effect throughout the entire country.

> *The new marksmanship qualification and familiarization courses are designed to eliminate the practice of modifying courses and to simplify them as far as possible.*

The new courses are arranged to satisfy basic requirements while meeting local conditions. As before, modification of record courses is not authorized.

The standard course is established for 100, 200, 300, and 500 yards—the same as previously—but under the revision only 50 rounds are fired as compared with 60 on the old course.

The new courses will not be applicable to units of the Reserve components until the Rifle Manual is revised. Publication of the new manual is expected in July.

Ordnance School

Aberdeen Proving Ground's Ordnance Officer Candidate School closed on April 25th after the graduation of Class No. 100.

This class was the eleventh since the reactivation of the Ordnance OCS in 1951. Class No. 88, with 50 candidates, went into training on November 26, 1951, and between that date and February 28, 1953, when class No. 98 graduated, 443 new Ordnance officers were commissioned out of the 913 candidates who started the course.

> *At peak strength, the OCS, which was directly under the Ordnance School at Aberdeen, had 50 officers and 140 enlisted men, headed by their original commanding officer, Lieut. Col. Josiah S. Kurtz.*

The graduation address to Class No. 98 on February 28, 1953, was given by Leo A. Codd, executive vice-president of the American Ordnance Association.

Redstone Arsenal, Huntsville, Ala., had no chapel. Brig. Gen. T. K. Vincent, Redstone's commanding officer, had a nice chapel constructed from several rooms in the Service Club, and a belfry was built over the entrance.

Then General Vincent had a thought: All Army chapels are built without a bell in the belfry. The custom is to have a bugle sound Church Call. But Redstone does not have a bugler, and since the chapel was a bit unusual General Vincent thought a bell would be proper.

The Southern Railway, which serves the area, is Dieselizing its trains and steam locomotive bells should be available, thought the general, so he wrote to the President of the Southern Railway, Harry A. DeButts, in Washington, stating his problem.

The result was a fine bronze bell, engraved "Gift of the Southern Railway." Another example of service for the finer things of life!

Air Force Slenderized

The Air Force, which halted all disposal of its excess equipment at the outbreak of the Korean War in 1950, recently announced that it will strip down to fighting trim.

The Air Matériel Command, which has charge of the storage of such equipment, said disposal can be resumed without jeopardizing the striking power of the Air Force.

> *Disposal of this excess, most of it in varying degrees of obsolescence, also will partly relieve the critical need for new warehousing and leased warehousing space.*

Before the equipment can be disposed of, however, retention levels must be established. This is now being done by fifteen AMC depots scattered throughout the country and is based upon policies established by USAF Headquarters.

First chance at the millions of dollars of equipment expected to be declared excess will be given to other armed services to fulfill any existing requirement they may have. If the armed forces do not have any requirement, the property becomes Department of Defense excess.

It is then offered to the General Services Administration to satisfy all other Federal agency requirements, including the Federal Security Agency for donation to public health and educational activities. When it has been determined that no requirements exist within the Federal Government for these excesses, the property will then be sold to the general public.

The equipment will range from hairpins to complete aircraft engines.

The Air Matériel Command intends to dispose first of excess items making up the greatest bulk in order to relieve pressure on its warehouses as soon as possible.

Artillery Ammunition

An Editorial

IN considering the adequacy of the supply of artillery ammunition in Korea, it is advisable, at the outset, to distinguish between the strategic and tactical aspects of a highly complex problem.

The global strategists in the Pentagon must consider our worldwide needs in deciding where and in what quantity ammunition is to be shipped. This will be determined, in the last analysis, by their estimate of the strategic importance of current and future operations in the various theaters.

Furthermore, they must make their decisions in terms of manufacturing, transportation, storage, and distribution factors. They must pay careful attention to stock levels in the United States and the amount of help that should be allocated to our allies. For this purpose we have the National Security Council, the Joint Chiefs of Staff, the Secretary of Defense, and so on through echelon on echelon of policy makers.

A general in the field, in command of troops in battle, very properly concerns himself with the immediate situation that confronts him. It is not his responsibility to worry about the possible implications of enemy attacks on American interests on the other side of the earth. He is not directly concerned about the progress of the war in far-removed theaters or the possibility of some new aggression against Americans or American interests elsewhere in the world.

Under these circumstances it is quite possible, and even likely, that a given field commander will disagree with the Pentagon strategists on what he thinks he should be given in men and equipment to accomplish his mission.

The Record in Korea

Turning now to the ammunition record in Korea, the unchallenged fact is that, during 1952, United Nations troops fired more than 10 times as many rounds of all types of ammunition as did the enemy—22,917,757 rounds as against 2,365,062 enemy rounds. During the peak of artillery shelling by the enemy last October and November, United Nations forces fired six times more shells.

This record would seem to indicate that there has been a large and apparently sufficient ammunition supply to carry on United Nations operations and to insure that our forces could withstand any attack the enemy could launch and sustain.

At the same time, it is quite possible that there have been instances when our units have run short of ammunition because of unusual weather or terrain conditions or because of enemy action. All the available evidence shows that these instances have been rare and temporary.

Despite the gigantic demands of the Korean War, the production of all types of ammunition is improving. The recent report of Maj. Gen. E. L. Ford, Chief of Ordnance of the Army, is conclusive proof that Army Ordnance and American industry are meeting the colossal challenge.

General Ford has stated that more than fifty-two million rounds of artillery ammunition and in excess of three billion rounds of small-arms ammunition, valued at about $2 billion, were produced by American industry and Army Ordnance plants during 1952.

General Ford declared that this huge production was accomplished by nearly 2,000 of the country's large and small industrial firms under contract with Army Ordnance and engaged in the manufacture of ammunition metal components, powders, and propellants, and in the loading and assembly of complete rounds.

The achievements of the Bureau of Ordnance of the Navy are equally heartening to the proponents of a strong national defense as the surest guaranty of peace. Both the Army and Navy Ordnance responsibilities are very great. They are in the hands of two most capable, industrious, and sincere officers—General Ford for Army Ordnance and Rear Adm. Malcolm F. Schoeffel for Navy Ordnance.

Ordnance Integration Committees

In reflecting upon the superb Ordnance accomplishment in ammunition production, a full measure of praise should be accorded the quietly efficient work of the Ordnance Integration Committees. In the field of heavy ammunition, for example, there are twelve official integration committees. They cover critical phases of the various operations in producing the several types. A total of 218 companies among producers of particular types or components of ammunition are represented on the committees. Also represented are the Army, Navy, and Air ordnance organizations.

The integration of ordnance contractors in a particular field, such as ammunition, carries forward a time-honored policy which worked so effectively during the First and Second World Wars and the years between. The Ordnance Engineering Committees of those days likewise carried a major responsibility with outstanding success.

The production of ammunition, with the invaluable help of the Ordnance Integration Committees, though a complicated process involving huge tonnages, would be a relatively routine matter were it not for red tape—much of it established by law! Before production can begin, the Ordnance organizations must involuntarily enroll in a sort of obstacle race and comply with an ever-growing number of laws and regulations that tend to impede or slow down production.

But in evaluating the status of artillery ammunition production today the effect of strategic decisions must not be confused with engineering difficulties. The production of the gigantic tonnages of artillery ammunition for today's war is a herculean task. Its greatest handicap is that ever-present governmental scourge—red tape!

New Assault Transport

The Lockheed C-130 four-engined turbo-prop assault transport is designed to fly higher and faster, or lower and slower, than any other military transport now in service. Its functions are: (1) Transport of cargo and troops, including paratroops, in front-line assault and support; (2) Evacuation of casualties from advanced positions; (3) Long-range support in cargo and personnel movement. Its rear loading ramp and forward cargo door speed up freight handling and turnaround time. The entire fuselage is pressurized, and tandem landing gear enables operation from soft and rough fields.

Reg. U. S. Pat. Off.

INDUSTRIAL PREPAREDNESS

a monthly report on current scientific and logistical developments as they relate to the national defense

AMERICAN ORDNANCE ASSOCIATION • *Founded in 1919* • 705 MILLS BUILDING, WASHINGTON, D. C.

No. 79 May 1953

The following is a report of the principal activities of the Technical Divisions and Committees of the American Ordnance Association for the year 1952 submitted to the Association's Board of Directors at its annual meeting held in Washington, D. C., March 4, 1953, by Louis Polk, A.O.A. vice-president in charge of the Technical Divisions and Committees.

Our National Technical Divisions and Committees have a rather comprehensive report of 1952's activities which continued on the same high level of performance which characterized their activities in previous years.

In this period some Committees were deactivated as directed. It is my responsibility to report, very respectfully, that we received numerous complaints and criticisms for dropping the Contract Regulations Committees and almost no favorable comment.

On the positive side, many important accomplishments resulted from careful planning and work of the various Committees. More than forty Technical Committee meetings, plus numerous special and subcommittee meetings on specific assignments, were completed.

Approximately 1,500 technicians, scientists, manufacturers, and service people, both military and civilian, met to present technical papers, discuss problems relating to ordnance and armament, reach decisions, and generally render valuable aid to the services and industry. Their combined experience and knowledge was most valuable, and all of this was done on a purely voluntary, unpaid basis by patriotic Americans.

In order that competent personnel from various fields may be attracted and held responsible for results, the organization of Technical Divisions and Committees is purposely not too tightly drawn. They are a spirited group—the kind that gets things done, and it is our responsibility to guide and direct them without diminishing their enthusiasm.

During 1952 some new chairmen were appointed, and many changes were made in the membership of the various Committees. As an example of the spirited group to which I have just referred, let me quote briefly from a letter written by the chairman of one of our Committees to an executive of another company who thought his concern should be represented on the Committee:

"I would like to consider the membership of one of your men but at the same time I must tell you that your company caused me a lot of trouble on that . . . (another ordnance job).

"Your people did not answer letters, they did not answer telegrams and, on several occasions, I had to resort to telephone calls. I cannot afford to go through that again on future A.O.A. work.

"If you want to nominate your top production man to the Committee and if he will perform in the manner outlined in the enclosed mimeographed statement (sent to all applicants), I would be glad to add him to the roll. I again repeat—your company would make a valuable contribution to the subject Committee, and I would like to see you nominate one of your men."

With this issue, the special bulletin, INDUSTRIAL PREPAREDNESS, is being incorporated in the bimonthly magazine, ORDNANCE, in order that all members of the American Ordnance Association may be kept currently informed of the activities of our national Technical Divisions and Committees.—THE EDITORS.

Copyright 1953 by the American Ordnance Association. To receive this bulletin and other A.O.A. publications regularly membership in the Association is requisite. Application will be sent upon request. Membership dues are $10.00 for three years, $4.00 for one year.

You can see that chairman took his job seriously. It is our policy to review the make-up of the groups in order to (1) draw desirable individuals into active participation, (2) relieve those unable to spare the time from their business for a longer period, (3) make available to the services a broader group of technical advisers, and (4) permit more qualified specialists to know each other and work together for national preparedness.

Because there is no security problem involved, we are reporting on one of our Technical Division meetings which was held at West Point. As you know, the U.S. Military Academy, West Point, N.Y., celebrated the 150th anniversary of its founding with appropriate ceremonies held at West Point from January to June of 1952. The Military Academy had designated April 22nd-25th as "Ordnance Week."

The A.O.A., in coöperation with the Superintendent of the Military Academy, arranged series of lectures, meetings, and technical exhibits at West Point during this week designed to stress the importance of Ordnance in the instruction of the Cadets and in the combat efficiency of the armed forces of our country.

As one of the events of "Ordnance Week," the annual meeting of the Gage Industry Division of our Association was held at West Point on Friday, April 25th. Cadets of the first class were invited to attend the technical sessions and to inspect a very interesting gage exhibit prepared jointly by the commanding officers of the Frankford and Detroit Arsenals.

In the evening a reception and dinner was held honoring the Superintendent and his staff. To this dinner were invited the members of the Congressional Board of Visitors who were making their annual visit to the Military Academy at that time.

The annual conference of chairmen was held in Washington, September 24, 1952, the same day as the meeting of the Board of Directors.

The chairmen of the Technical Divisions met with Louis Polk, A.O.A. vice-president in charge of Divisions and Committees; Henry N. Marsh, general chairman; Burton O. Lewis, staff consultant; and Leo A. Codd, A.O.A. executive-vice-president, for an informal breakfast meeting at the Waldorf-Astoria Hotel, December 3rd—the day of the annual New York dinner meeting, to discuss current policies and procedures and to formulate necessary plans for the year ahead.

In the December 1952 issue of INDUSTRIAL PREPAREDNESS, a personal letter was sent to all members of the Technical Committees expressing sincere appreciation for their time and efforts so unselfishly given to our work and in general terms outlining the duties, responsibilities, and policies in affording advisory assistance to the armed services.

To stimulate greater interest among the over-all membership, INDUSTRIAL PREPAREDNESS will now be incorporated in the bimonthy magazine ORDNANCE. On the alternate months it will continue to be mailed to the members of the Technical Committees as heretofore. In addition, chairmen will be asked to submit articles on Committee work to be published in ORDNANCE, as well as digest reports of meetings of their groups for INDUSTRIAL PREPAREDNESS. Naturally, the matter of not revealing classified information will be observed.

Each Committee chairman was asked to prepare a report on the work of his Committee in 1952. The majority of these reports have been received and are being assembled into a master report. Copies of this report are available to directors of the Association and will also be furnished to the Ordnance offices of the Armed Forces—Army, Navy, and Air Force.

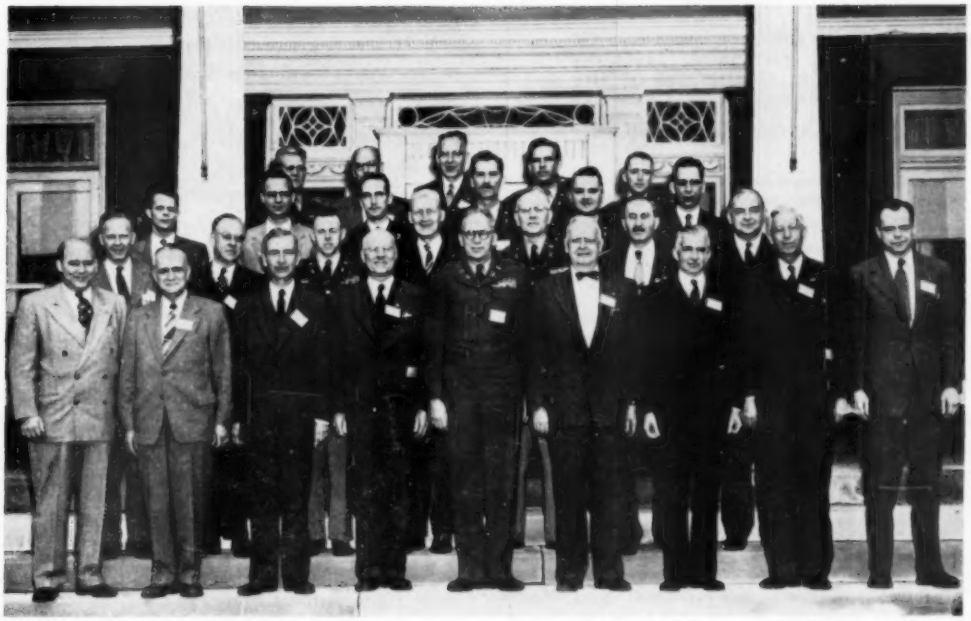
Based on the comments and recommendations of our chairmen's meetings and as a result of careful study of the chairmen's reports for the past year, plus the desires of the services, the following actions are planned during the coming year:

A. In order to insure maximum coördination and efficiency of operation within the several Technical Divisions, we will hold meetings of the executive board and Committee chairmen of each Division under the leadership of the Division chairmen. To these meetings will be invited top representatives of the three services interested in the particular work of each Division so that definite plans can be formulated for rendering the maximum technical service.

The Fire Control Instrument Division already has its plans well under way for such a meeting to be held at the Frankford Arsenal, Pa., on Friday, March 27, 1953. The Packing and Packaging Division is arranging for a meeting to be held in April during the Annual Management Association's Conference and Exposition at Chicago, Ill.

Meetings of the other Divisions will be held during the course of this year, possibly in connection with regional or national meetings of our Association.

B. The membership of all Divisions and Committees will be reviewed to insure that their members reflect the engineering experience and production "know-how" of the present Korean emergency as well as of World War II. This action is essential to keep our technical organizations up to date and in a "position of readiness" to handle ordnance problems if and when the official integration committees



Meeting of the Executive Staff of the A.O.A. Fire Control Instrument Division, Frankford Arsenal, Pa., March 27, 1953. *First row, left to right:* W. M. Brandes, Elgin National Watch Company; Col. G. B. Welch, Mergenthaler Linotype Company; Dr. D. A. Quarles, Sandia Corporation; Col. R. L. Goetzenberger, chairman, A.O.A. Fire Control Instrument Division; Col. W. E. Becker, commanding officer, Frankford Arsenal; Brig. Gen. Burton O. Lewis, staff consultant, A.O.A.; P. R. Bassett, Sperry Gyroscope Company; Col. H. N. Marsh, Hercules Powder Company; Dr. W. S. Carlson, Frankford Arsenal. *Second row, left to right:* G. W. Cain, Frankford Arsenal; W. T. Roach, Eastman Kodak Company; Lieut. Col. F. J. Wasson, Jr., Office, Chief of Ordnance, Washington, D. C.; F. E. Ericson, Barden Corporation; Col. H. Ely, Frankford Arsenal; M. Goldberg, Navy Department; F. R. Lack, Western Electric Company. *Third row, left to right:* H. C. Maulshagen, Eglin Air Force Base, Fla.; J. M. Thress, Frankford Arsenal; Lieut. E. J. Costello, Navy Department; Lieut. Col. R. Johnson, Frankford Arsenal; Lieut. Col. P. Nilsson, Frankford Arsenal; Lieut. Col. A. E. Gee, Frankford Arsenal; K. E. Reynolds, Bausch & Lomb Optical Company. *Fourth row, left to right:* Col. T. Kane, Frankford Arsenal; H. C. Carroll, General Electric Company; G. P. Luckey, Hamilton Watch Company; and Capt. R. A. Bergmann, Frankford Arsenal.

cease to function by the termination of the National Production Act. Care is always exercised not to duplicate the work of corresponding official integration committees established by the Chief of Ordnance, U.S. Army, under the provisions of the National Production Act.

C. Complete the compliance of the Technical Divisions' membership with the new security regulations, which will require a fingerprint impression card and a statement of personal history. Every one, both in and out of the Defense Establishment, in uniform or civilian, who has anything to do with classified information is required to execute these two new forms. With an appropriate letter of transmittal, the forms are now being sent to all members of the Technical Divisions and Committees for completion. New type identification cards will be issued by the Chief of Ordnance as these new security forms are executed.

In summarizing the performance of the Technical Divisions and Committees, they have done and are doing a fine job in bringing about a better understanding of subjects relating to ordnance and armament manufacture among American industry and the services.

I want to put into the record that Henry Marsh, General Lewis, and Colonel Codd have done an excellent job of reviewing, checking, and assisting in the organizing work. Staff members, together with Mr. Marsh and Division chairmen, have attended many meetings, listened carefully, answered questions, made suggestions, and have been truly helpful.

While our intentions naturally are always better than our achievements, may I again express to the directors and officers and the headquarters staff our thanks and my personal appreciation for their helpful coöperation.

(*Sgd.*) LOUIS POLK

Vice-president in charge of Technical Divisions and Committees, American Ordnance Association

FUTURE SCHEDULED MEETINGS OF NATIONAL TECHNICAL DIVISIONS AND SPECIAL COMMITTEES OF THE AMERICAN ORDNANCE ASSOCIATION

- **Metal Lubricants Committee at Washington, D.C., May 1953.**
- **Instrument Precision Ball Bearings Committee of the Fire Control Instrument Division at the Naval Ordnance Plant, Indianapolis, Ind., May 7, 1953.**
- **Loading Committee of the Rocket, Bomb and Artillery Ammunition Division at the Iowa Ordnance Plant, Burlington, Iowa, May 13 and 14, 1953.**
- **Surface Preservation Subcommittee, Shell Committee, Rocket, Bomb and Artillery Ammunition Division, Detroit, Mich., June 4, 1953.**
- **Powder Metallurgy Committee, Shell Committee, Rocket, Bomb and Artillery Ammunition Division, at Washington, D.C., June 10, 1953.**
- **Fuze Committee of the Rocket, Bomb and Artillery Ammunition Division at Chicago, Ill., June 1953.**
- **Shell Committee of the Rocket, Bomb and Artillery Ammunition Division at Chicago, Ill., June 1953.**

• **Robert L. Telford,** vice-president, Silas Mason Company, who is the chairman of the Rocket, Bomb and Artillery Ammunition Division of the American Ordnance Association, reports that numerous changes have recently been made in the membership of the Loading Committee.

These changes were made so as to bring to the Committee new members who are engaged in ammunition-loading activities during this present emergency and to relieve old members who are no longer connected with ammunition loading.

The officers and directors of the American Ordnance Association desire to welcome the new members and sincerely thank the retiring members for past services and the generous contribution of their time and talents to the technical activities of our Association.

The following list shows the regular and advisory members of the present Loading Committee:

Regular Members: J. G. Pleasants, vice-president in charge of manufacturing, Procter & Gamble Company, Cincinnati, Ohio, *chairman;*

B. B. Bond, Remington Rand Inc., Stamford, Conn.;

Paul Borda, general manager, Ravenna Arsenal, Apco, Ohio;

Joel G. Holmes, plant manager, Silas Mason Company, Iowa Ordnance Plant, Burlington, Iowa;

O. M. Jank, general manager, Lone Star Ordnance Division, Day & Zimmermann, Inc., Texarkana, Tex.;

J. E. Pruden, Procter & Gamble Defense Corporation, Milan, Tenn.;

J. A. Ward, general manager, Remington Rand Inc., Louisiana Ordnance Plant, Shreveport, La.;

Keith W. Waugh, general manager, National Gypsum Company, Nebraska Ordnance Plant, Wahoo, Nebr.

Advisory Members: J. L. Carroll, Ordnance Assembly Plant, Army Chemical Center, Md.;

George N. Constan, chief of operations, Ordnance Corps, Joliet Arsenal, Joliet, Ill.;

R. W. Cuthill, Office of the Chief of Ordnance, Washington, D. C.;

C. F. Fitzer, Picatinny Arsenal, Dover, N. J.;

H. L. Guenzler, Ordnance Ammunition Center, Joliet, Ill.;

H. M. Krengel, production manager, Ravenna Arsenal, Apco, Ohio;

C. E. Merry, director of manufacturing, National Gypsum Company, Nebraska Ordnance Plant, Wahoo, Nebr.;

James N. Pearre, technical director, Silas Mason Company, Iowa Ordnance Plant, Burlington, Iowa;

E. W. Peterson, general manager, Kingsbury Division, American Safety Razor Corporation, La Porte, Ind.;

H. B. Stevenson, chief technical engineer, Procter & Gamble Defense Corporation, Milan, Tenn.

In the months in which ORDNANCE *magazine is not published,* INDUSTRIAL PREPAREDNESS *is sent directly to the members of the A.O.A. Technical Divisions and Committees. Other A.O.A. members who wish to receive this bulletin in these months should send their request to the Editorial Offices of the Association, 705 Mills Building, Washington 6, D. C.*

ASSOCIATION AFFAIRS

• **DIRECTORS' MEETING.**—The Board of Directors of the American Ordnance Association held its regular winter meeting at Washington on March 4, 1953. Roger M. Kyes, Deputy Secretary of Defense, was the guest of the Board at luncheon following a morning of deliberations devoted to the progress of the Association. Levin H. Campbell, Jr., president, presided at the meeting and at luncheon.

Other officers and directors who were in attendance at the meeting were: W. H. P. Blandy, New York; Donald F. Carpenter, Wilmington; C. Stewart Comeaux, Oklawaha, Fla.; Henry P. Erwin, Washington; Herbert A. Gidney, Fort Lauderdale; E. R. Godfrey, Detroit; C. Jared Ingersoll, Philadelphia; Harvey C. Knowles, Cincinnati; Daniel J. Martin, Houston; Henry N. Marsh, Wilmington; Frederick H. Payne, Springfield, Mass.; John S. Pfeil, Boston; Louis Polk, Dayton; J. E. Trainer, Akron.

Also present were Florence G. Ferriter, secretary of the Association; Burton O. Lewis, staff consultant; Roger E. Lewis, managing editor; and Leo A. Codd, executive vice-president—all of the Washington headquarters staff of the Association.

As announced on page 937 of this issue, the Board established in memory of the late James L. Walsh an annual prize essay award of $1,000. This award will help perpetuate among younger members of the Ordnance fraternity a growing interest in the solution of ordnance problems.

Colonel Walsh, who died June 11, 1952, was a founder of the Ordnance Association in 1919, first editor of ARMY ORDNANCE magazine, a director of the Association from its organization until his death, and president from 1947 to 1952.

A special committee was appointed by the Board to recommend a policy on behalf of the Association concerning reserve ordnance production capacity as an essential part of the national defense of the United States. The committee will be under the chairmanship of Admiral Blandy, former Chief of the Bureau of Ordnance of the Navy and presently president of the Health Information Foundation, New York.

Other members of the committee are Rodger J. Emmert, General Motors Corporation, Detroit; Howard E. Isham, United States Steel Corporation, New York; W. G. Lockwood, American Locomotive Company, Washington; K. T. Norris, Norris-Thermador Corporation, Los Angeles.

The Board considered the customary reports of officers on operations for the past year. These included reports by Colonel Erwin, treasurer, on the finances of the Association based upon the annual audit of the Association's records by Ernst & Ernst, certified public accountants; by Miss Ferriter, secretary, on membership and extension activities; by Mr. Polk, general chairman of Technical Divisions and Committees, on the activities of these groups (published in full in the Industrial Preparedness section of this issue on page 949); by Mr. Lewis, managing editor of A.O.A. publications; and by Colonel Codd, executive vice-president, who described the works of the Posts during the past year and who also presented the budget for 1953.

The Board approved plans for increasing the membership of the Association, especially through the cooperation of membership committees of the several local Posts. Plans in this field will be announced in future issues of ORDNANCE.

The Col. Herbert W. Alden prize essay contest for 1953, open to students of the Ordnance School, Aberdeen Proving Ground, will be announced at the school shortly by Brig. Gen. W. R. Slaughter, commandant. The contest is open to all students of the school, and the subject and the selection of the winner will be determined by the faculty.

The Alden Award, which is a cash prize of $100, was established five years ago by the Timken-Detroit Axle Company in memory of Colonel Alden, its chief engineer and a director of the company for many years.

Colonel Alden served in the Ordnance Department of the Army in the First World War and for many years was a valued Ordnance consultant and adviser on automotive engineering matters. He was one of the founders of the American Ordnance Association, and in 1941 was awarded the Association's Gold Medal for Distinguished Ordnance Service.

• **AT WASHINGTON.**—The guest speaker at the February 19th luncheon meeting of the Washington Post at the National Press Club was Brig. Gen. L. I. Davis, Director of Armament, Air Research and Development Command, U. S. Air Force.

General Davis is a graduate of West Point, the flying schools at Randolph and Kelly Fields, and the Massachusetts Institute of Technology aeronautical engineering school. He has held a series of important engineering and technical positions in the Air Force. Prior to his present assignment he was Commandant of the USAF Institute of Technology.

General Davis spoke on the "weapons system" concept which is related to the trend in modern aircraft toward increased size and increased weight of equipment. He noted how the atomic bomb has influenced armament systems which have no resemblance to World War II equipment. A comparison of F-86 performance with the MIG-15 in Korea pointed out the need for an efficient weapons system.

The Washington Post's March 19th luncheon meeting featured Capt. Edward L. Woodyard, commander of the Naval Ordnance Laboratory, White Oak, Md.

Captain Woodyard is a graduate of the Naval Academy. Since graduation he has had many assignments connected with ordnance, both ashore and afloat. During World War II he was executive officer of a cruiser in the Pacific and was assigned to the Tenth Army during the invasion of Okinawa.

He was in command of the cruiser ROCHESTER, flagship of the Seventh Fleet, at the outbreak of the war in Korea. He has been commander of the Naval Ordnance Laboratory since June 1952.

Captain Woodyard spoke on the mission of the Naval Ordnance Laboratory at White Oak.

• **AT DETROIT.**—The Spring Dinner Meeting of the Michigan Post was held at the Sheraton-Cadillac Hotel on March 18, 1953. The guest of honor and principal speaker was Gen. Alfred M. Gruenther, Chief of Staff of Supreme Headquarters, Allied Powers in Europe.

Approximately 700 American Ordnance Association members and their guests

were deeply impressed by the highly informative talk given by one of the Army's most decorated men who is widely recognized as one of the Nation's top military planners.

General Gruenther's important address is published in full on page 922 of this issue of ORDNANCE.

A distinguished military career, during which General Gruenther became the youngest 4-star general in the United States Army, began upon graduation from the United States Military Academy in November 1918, at the age of 19.

In World War II, service overseas, including both the North African Campaign and the Italian Campaign from the Salerno landing in 1943 until the German surrender in Italy in 1945, preceded a tour as deputy commandant of the National War College and later as director of the joint staff set up to prepare logistic plans for the Joint Chiefs of Staff.

General Eisenhower called General Gruenther "My right arm"; Field Marshal Montgomery referred to him as "The Brain"; to Gen. Mark Clark he was "The best damned soldier in the Army."

• **AT ST. LOUIS.**—The 1953 Annual Meeting of the St. Louis Post was held on March 10th at the U. S. Naval Air Station, adjacent to Lambert Field.

This meeting was of special interest to Association members because it provided an opportunity to welcome and become acquainted with Col. F. G. Bryan, deputy chief of the St. Louis Ordnance District, and to greet and renew old friendships with the guest speaker, Brig. Gen. Merle H. Davis, chief, Ammunition Branch, Office of the Chief of Army Ordnance.

The meeting began with a buffet supper and a reception in honor of General Davis and Colonel Bryan. General Davis, then Colonel Davis, was a World War II chief of the St. Louis District.

Capt. J. I. Bandy, U. S. N., commanding officer of the U. S. Naval Air Station, was a most hospitable host. The dinner was delightfully served and although the attendance was such as to tax the facilities of the station the ease and geniality of all personnel added immeasurably to the enjoyment of the occasion.

The following members are now serving as Post officers: Walter Siegrist, president; William P. Gatley, vice-president; Irvin L. Jerger, secretary; and Winfield E. Hartford, treasurer.

Directors of the Post include W. M. Akin, Captain Bandy, Colonel Bryan, Carlisle I. Ferris, Aaron Fisher, Russell E. Gardner, Jr., Stanley Jackes, Edward F. Judge, John N. Marshall, J. Wesley McAfee, Edwin B. Meissner, Clyde H. Morgan, Wallace A. Morse, John M. Olin, and L. J. Sverdrup.

Florida Post Sponsors Regional Meeting of A.O.A. at Miami Beach

A committee of Florida Post members was assembled last December to work out a program for the 1953 season. George M. Corrigan, Col. Fred A. McMahon, James W. Dunaway, Otto J. Doepel, and Col. Charles G. Mettler served on this planning committee.

The decision was made to hold a dinner meeting at the Indian Creek Country Club in Miami and to invite a nationally prominent leader as guest speaker. Subsequently it was decided to expand the Post meeting into a Florida Regional Meeting, and all members of the American Ordnance Association were invited to attend. The meeting proved to be an outstanding success.

A seminar was held at four o'clock in the afternoon and lasted one hour. It was under the auspices of the Armament Test Center, U. S. Air Force, Eglin Air Force Base, Fla. Brig. Gen. E. P. Mechling, commanding, conducted the seminar which was devoted to discussions of aircraft armament progress in which the Technical Divisions and Committees of the American Ordnance Association are taking an important part.

The seminar was well prepared and very effectively presented. Eighty members and guests were present and many questions were asked.

The honor guest and principal speaker at the dinner meeting in the evening was Gen. Lemuel C. Shepherd, Jr., Commandant, U. S. Marine Corps. A reception in honor of General Shepherd was held at 6:30 p. m., followed by dinner at 7:30. The distinguished leader of the Marines presented a brief history of the Corps and then spoke about the progress of our forces in the Korean Campaign.

General Shepherd has made nine trips to Korea to assist in planning Marine Corps strategy and to witness the outcome of various actions.

Herbert A. Gidney, vice-president of the American Ordnance Association, presided at the dinner meeting. The toastmaster was Burton O. Lewis, staff consultant at National Headquarters of the Association. General Shepherd was introduced by Colonel Mettler, chairman of the Florida Committee of the Association. Lieut. Tom W. Fetzer sang the National Anthem and, later in the program, the Marine Corps anthem.

The Reception Committee was headed by Colonel Mettler, chairman, and Mr. Corrigan, vice-chairman.

The committee also included Comdr. Walter S. Ginn, Col. B. M. Kilgore, Colonel McMahon, Lieut. Col. J. Dudley Murray, Louis Cayll, Mr. Dunaway, Mr. Doepel, Richard F. D'Heere, Russell L. Heberling, Brig. Gen. Albert D. Cooley, Col. John A. Brooks, Col. Edson A. Lynn, and Col. Stewart H. Elliott.

Guests at the speakers' table included General Shepherd, Colonel Mettler, Mr. Corrigan, General Lewis, General Cooley, Harlow H. Curtice, Lieut. Col. R. L. Dickson, Harry R. Fruehauf, Colonel Gidney, E. R. Godfrey, Arnold Hanger, Mr. Heberling, K. T. Keller, Charles F. Kettering, James L. Knight, General Mechling, Lieut. Comdr. Charles A. Mills, Col. Nelson S. Morris, G. Fred Obrecht, Charles E. Sorensen, Lieut. Gen. Richard Sutherland, and Eugene Welkers.

Father and Son Night Is Featured at Cambridge Meeting of Yankee Post

The Faculty Club at the Massachusetts Institute of Technology was the meeting place for the Midwinter Meeting of the Yankee Post on March 5th.

A special program of interest to young people of high-school age and their fathers was arranged. Members were urged to bring their own sons or to "borrow" a relative or neighbor's son. They witnessed a very interesting show.

Staff members of Arthur D. Little, Inc., well-known research organization, amazed and amused members and guests with demonstrations of extreme-low-temperature equipment, liquids, and gases.

Professor Donald P. Campbell of M.I.T.'s Servomechanisms Laboratory showed the operation of a portable servo with a radio link.

Highlighting the meeting was an address, "Brains for Iron Birds," by M.I.T. Professor C. Stark Draper.

It is not easy to hit a moving target. Add speeds of 600 to 1,200 miles an hour, atmospheric quirks, evasive tactics, and the aircraft pilot's own movements, and Post members had no difficulty in appreciating the problems that are overcome by to-day's gun-sighting and computing devices.

Professor Draper has a long list of important defense assignments, including that of panel member of the Research and Development Board of the National

The gentlemen shown above, left to right, were recently elected vice-presidents of the Association: John M. Olin, president, Olin Industries, Inc., East Alton, Ill., member Advisory Board, A.O.A.; Fairman B. Lee, president, Fairman B. Lee Company, Seattle, Wash., member of Council, A.O.A.; K. T. Norris, president, Norris-Thermador Corporation, Los Angeles, Calif., member of Council, A.O.A.; and Dean Witter, partner, Dean Witter & Company, San Francisco, Calif., member of Council, A.O.A.

Military Establishment. He received the Medal for Merit and the Exceptional Service Award in recognition of outstanding service in the fields of airborne and ground-based fire-control systems.

To climax the evening, "Men of Science," filmed at the Massachusetts Institute of Technology as a chapter in RKO-Pathé's "This Is America" series, was shown. This film has been enthusiastically received at previews and will shortly be shown in first-run theaters from coast to coast.

Because seating space in the Faculty Club was limited, attendance was held to a maximum of 200 members and young guests. There was unanimous agreement that the Father and Son Night was a most successful innovation in Post meetings.

Harry A. Wansker, president of the Post, presided at the meeting. The invited guests at the head table during the Midwinter Meeting were as follows: Helge Holst, vice-president, Yankee Post; John S. Pfeil, director, Yankee Post; John C. Dieselman, secretary-treasurer, Yankee Post; Vice Adm. Edward L. Cochrane, Ret., dean of engineering at M.I.T.; Col. Paul D. Sherman, commanding officer, Marine Barracks, U. S. Naval Base at Boston; Roy F. Williams, director, Yankee Post; Dr. Charles Stark Draper, head, Department of Aëronautical Engineering, and director of the Instrumentation Laboratory at M.I.T.; Capt. Pleasant D. Gold, commandant, Boston Naval Shipyard; Stanley A. Hoff, president of the M.I.T. Post of the Association; Malcolm G. Kispert, executive assistant to the president of M.I.T.; Brig. Gen. J. F. McMannon, chairman, Armed Forces Regional Council at Boston; and Col. D. G. Ludlam of the Boston Ordnance District.

Also at the head table were Col. B. S. Mesick, commanding officer, Watertown Arsenal, Mass.; Col. H. W. Serig, vice commander, Air Force Cambridge Research Center, Mass.; Leo A. Codd, executive vice-president, American Ordnance Association; David Gilman, director, Yankee Post; Col. John C. Nickerson, Special Weapons, Ordnance Corps; and Carl F. Carlstrom, director, Yankee Post.

Capital Cities Post Members Make Tour of Allegheny-Ludlum Steel Company Plant

One hundred and seventy members and guests attended the Midseason Meeting of Capital Cities Post, American Ordnance Association, at the Circle Inn, Lathams, N. Y., on March 24, 1953. The dinner meeting was followed by a guided tour of the Watervliet plant of the Allegheny-Ludlum Steel Company.

The meeting was planned by William C. Elcan of the General Electric Company, chairman of the Post Committee on Meetings and Programs.

The meeting was presided over by Col. Richard Z. Crane, commanding officer of Watervliet Arsenal and first vice-president of the Capital Cities Post, in the absence of Post President Ernest E. Johnson, also of General Electric.

George R. Reindel of the Allegheny-Ludlum Steel Company at Watervliet, acting for Arthur H. Hanks, arranged for the plant tour which was conducted by selected key foremen and engineers with intimate knowledge of the operations.

Among the operations visited and observed were the melting department, rolling and blooming mills, hammer shop, annealing, finishing, and grinding departments.

Announcement was made by Colonel Crane of the recent organization of a Student Chapter at Rensselaer Polytechnic Institute and the election of four Capital Cities Post directors for three-year terms to expire in 1956. Directors selected are Ross L. Fryer, Jr., American Locomotive Company, Schenectady, N. Y.; Eugene H. Haller, Watervliet Arsenal; Charles E. Smart, W. & L. E. Gurley Company, Troy; and Earl D. Rhodes, Kenwood Mills, Rensselaer, N. Y.

Among the guests was Rear Adm. Charles D. Wheelock, U. S. Navy, Inspector General of the Bureau of Ships, from San Francisco, Calif.

• **AT HANOVER.**—Members of the Dartmouth College Chapter of the Yankee Post held a meeting on February 17th which featured C. J. Livingston of the Gulf Oil Corporation as guest speaker.

Mr. Livingston has been in the product development and product engineering division of the company for many years. A leading research engineer, he was formerly a captain in the Navy and recently returned from a special assignment with the Defense Department. Having visited all the fighting fronts in Korea and many Ordnance centers in Japan, Mr. Livingston was particularly well qualified to speak on "The Use of Petroleum Products in Ordnance Equipment."

The meeting was held in Carpenter Hall on the campus. Refreshments were served after the lecture, and students had an opportunity to talk personally with Mr. Livingston. Several geology majors were very happy to talk to the guest speaker about fuels, oils, and lubricants in modern war.

• **AT FORT WORTH.**—A meeting of the officers and directors of the Lone

Star Post was held in Fort Worth, Tex., on February 20th for the purpose of electing officers and directors to serve the Post for the ensuing year.

As a result of this meeting and the annual meeting of the Post, held on December 12, 1952, the following members were elected and are now in office:

President, Warren W. Wells; vice-president, R. H. Norris; national councilor, George W. Armstrong; and secretary-treasurer, W. M. Harrison.

The new directors include F. B. McKimball, F. L. LeBus, C. A. Fischer, R. F. Flannagan, John Wilson, M. J. Neeley, and C. V. Fletcher.

• **AT PHILADELPHIA.**—The Industrial Committee of the Philadelphia Post held a meeting on March 10th in honor of the Franklin Institute, Baldwin-Lima-Hamilton Corporation, Bethlehem Steel Company, and Philadelphia Gear Works.

These organizations were the leaders in the development and manufacture of the atomic cannon (known technically as the 280-mm. gun).

Members had an opportunity to see the operation of the gun, as well as to hear from the companies involved the story of its development and manufacture, and from Army Field Forces the story of its tactical use in the field.

The meeting started at the plant of the Baldwin-Lima-Hamilton Corporation, Eddystone, Pa., at 3:30 o'clock in the afternoon with a demonstration of the atomic cannon. The meeting then transferred to the Franklin Institute where dinner was served at 5:45 p.m.

The committee in charge of the meeting consisted of Richard Nalle, Dr. H. B. Allen, G. W. Struble, A. R. Wisner, Col. W. M. Tisdale, A. W. Gilmer, and R. T. Gebler.

• **NEW FILMS.**—The Department of Defense announced the release of a documentary film, "Target Nevada," illustrating Air Force assistance to the Atomic Energy Commission during nuclear tests at the Nevada Proving Ground near Las Vegas.

The film can be obtained by local Posts of the American Ordnance Association from the major commands of the Air Force in various parts of the country.

The film includes scenes of several atomic detonations. It shows the delivery of a nuclear device by one of the Air Force's B-50 Boeing Superfortresses at the Nevada Proving Ground.

"Target Nevada" is a 16-mm. Kodachrome film. Running time is fourteen minutes.

Another film about ready for release by the Army Signal Corps is a military training film entitled "Maintenance on Track Vehicles." It is designed to show future tankers of the Army how important it is to keep their tanks in top-notch condition.

The film was shot at Fort Hood and requires less than an hour for showing. The Army's M-47 medium tank is used for demonstration purposes.

A new, full-color, 35-mm. sound-slide film, describing the American Smelting and Refining Company's patented process for continuous casting of bronze rod, tubes, and shapes, also is available to interested groups without obligation. The film is in two parts of about fifteen minutes each. The first section describes in brilliant color transparencies the history of the process, its engineering details, and its results. The second emphasizes typical applications for which this material is used in industrial plants. Where possible, a lecturer is provided.

Student Chapter of Association Founded at Rensselaer Polytechnic Institute, Troy

With the hearty cooperation of the Capital Cities Post, a new Student Chapter of the American Ordnance Association has been established at Rensselaer Polytechnic Institute, Troy, N. Y.

The first meeting was held on February 12th in the Troy Building on the campus. Present at this inaugural meeting were Ernest E. Johnson, president of the Capital Cities Post; Edward S. Webster, secretary-treasurer of the Post; Prof. A. K. Booth, Post chairman of the Committee on Student Activities; and Lieut. Col. Philip H. Baker of the Reserve Officers' Training Corps at Rensselaer.

The purpose and organization of the American Ordnance Association were briefly described. The response was immediate and enthusiastic on the part of the student audience and steps were taken to organize a chapter.

On March 3rd a much larger group assembled for the purpose of electing officers. The successful candidates were president, Charles M. Pomeroy, III; vice-president, William M. Lewis; secretary-treasurer, Ronald R. Rucinski; activities chairman, John E. Stricklin; and membership chairman, Ronald J. Cococcia.

Two faculty advisers were chosen. They were Colonel Baker and Prof. A. E. Burr. M/Sgt. Kenneth E. Kennedy was appointed to act as adviser to the secretary-treasurer. Mr. Webster gave a digest of the history of the American Ordnance Association, both nationally and locally.

Forty-three students signed up for charter membership, and more applications are anticipated. Although the membership thus far is composed of R.O.T.C. students at Rensselaer, all students at the Institute who are citizens and interested in ordnance are eligible for membership in the new chapter.

Maj. Gen. J. L. Holman, third from left, above, commanding general of Aberdeen Proving Ground, Md., was the guest of honor at a meeting of the Aberdeen Post on March 19th. He is shown with G. A. Gustafson, a Post director, left; B. S. Goodwin, president; L. A. Codd, executive vice-president of the A.O.A.; T. F. Colleran, chief engineer of A.P.G. and a Post director; and J. N. McKinley, Post secretary, right.

Shown above at the organization meeting of the R.P.I. Chapter, Capital Cities Post, are, left to right: E. S. Webster, secretary-treasurer of the Post; C. M. Pomeroy, III, president of the student chapter; and Lieut. Col. P. H. Baker, assigned to the Rensselaer R.O.T.C. unit and faculty adviser to the A.O.A. chapter.

The first group project was a tour of Watervliet Arsenal. This included exhibitions of motion pictures, "The Fundamentals of Artillery" and "The Great Gun," the latter film showing the new atomic cannon in action.

Also included in the tour were some of the modern facilities in the research and development laboratory and a variety of interesting manufacturing operations in the arsenal shops.

The chapter was represented at the midseason meeting of the Capital Cities Post, held on March 24th at the Circle Inn, Lathams, N. Y. The meeting was followed by a guided tour of the Allegheny-Ludlum Steel Company plant at Watervliet, N. Y.

With such a fine beginning, the student chapter of the American Ordnance Association at Rensselaer Polytechnic Institute promises to be a real success.

• **COL. JAMES STEVENSON CRAWFORD**, former president of the Yankee Post and formerly chief of the Boston Army Ordnance District, died in Jamaica Plain, Mass., on February 6, 1953. His career in the Ordnance Department of the Army extended over more than thirty years during which time he filled many posts of great responsibility with outstanding success.

Colonel Crawford was a native of Cambridge, Mass. He majored in mechanical engineering at Tufts College and also attended the Massachusetts Institute of Technology. He began his military career as a sergeant in the Massachusetts National Guard.

At the outbreak of the First World War he was commissioned a first lieutenant and served in the Ordnance Department throughout that conflict. He was post Ordnance officer at Fort Devens and subsequently officer in charge of shops at the Watertown Arsenal. From 1931 to 1935 he was executive officer of the Manufacturing Service, Office of the Chief of Ordnance, in Washington.

During seven important years in the progress of industrial mobilization planning Colonel Crawford served as chief of the Boston Ordnance District. Later he was commanding officer of the Iowa Ordnance Plant at Burlington, Iowa, and subsequently Ordnance officer at the New York Port of Embarkation. He retired from active military service in May 1945. He was president of the Yankee Post during 1948-1949.

Prior to his military service he was associated with the Hood Rubber Company, Watertown, as an engineer, and the Keniston Engineering Company of Boston.

An ardent member of the Ordnance Association, Jim Crawford was revered by his many friends, especially those in New England, for his devotion to the best interests of our national defense.

Throughout industry in Massachusetts he was regarded highly for his administrative ability in bringing the ordnance and industrial points of view into close coöperation. His memory will be a guiding light to the Ordnance fraternity of the Bay State for many years to come.

• **H. M. A. HARTMANN**, chief mechanical engineer of the Magnetic Metals Company, died recently in Camden, N. J.

Mr. Hartmann had been employed by the company only a few months. Previously he had been associated with the American Engineering Company of Philadelphia in the capacity of mechanical engineer.

During his twenty-five years' residence in the United States, Mr. Hartmann had worked for a considerable period with the Edward G. Budd Company of Philadelphia and the Alan Wood Steel Company of Conshohocken, Pa. He was also at one time in the employ of the Campbell Soup Company.

Born fifty-two years ago in Germany, he received his technical training there in engineering before coming to the United States.

• **HARRISON SMITH**, a partner in the New York engineering firm of Sanderson & Porter, and a valued member of the Association, died at his home in Greenwich, Conn., after an illness of several months.

During World War II he was resident partner of his concern in charge of design, construction, and operation of the Government-owned ammunition-loading plant, known as the Elwood Ordnance Plant, in Joliet, Ill.

During World War I, Mr. Smith was assistant superintendent for the T. A. Gillespie Loading Company on the construction and operation of a shell-loading plant for Ordnance at South Amboy, N. J.

Mr. Smith became associated with Sanderson & Porter in 1919 and was engaged in the design and construction of oil pipelines and in investigations and reports on oil and refinery properties and natural gas projects. He was made a partner in 1929.

• **RAYMOND L. O'BRIEN**, a life member of the American Ordnance Association and president and general manager of the Detroit Brass & Malleable Company, died in New York on March 25th while on a business trip. Born in Springfield, Mass., Mr. O'Brien joined the Detroit company in 1916 and became its president in 1938.

Mr. O'Brien first became associated with U. S. Army Ordnance activities early in 1941 when he negotiated contracts with the Ordnance Department for production of the .253 fuze, a component employed in the 20-mm. shell. In connection with the production of the M2OA4 booster, Mr. O'Brien supervised this program for his company and eventually became active in the entire program involving other contractors.

When the M21A4 booster program again went into production, after the outbreak of the Korean conflict, he was appointed industrial chairman of the integrating committee for this component.

His untiring efforts in behalf of the national defense will be sorely missed by the Nation and his many friends among the Ordnance fraternity.

Chairmen of A.O.A. Technical

OPERATING COMMITTEE

Louis Polk
A.O.A. vice-president in charge of Technical Divisions and Committees

Harvey C. Knowles
Vice-president, American Ordnance Association

Henry N. Marsh
General chairman, Technical Divisions and Committees

Burton O. Lewis
Staff consultant, American Ordnance Association

SPECIAL COMMITTEE

Levin H. Campbell
President, American Ordnance Association

Walter W. Tangeman
Chairman, Machine Tool Committee

Wilbur J. Reitze
Chairman, Metal Lubricants Committee

George H. Willits
Chairman, Patents Committee

FIRE CONTROL INSTRUMENT DIVISION

R. L. Goetzenberger
Chairman, Fire Control Instrument Division

P. R. Bassett
Deputy chairman, Fire Control Instrument Division

William T. Roach
Chairman, Optical Committee

Donald A. Quarles
Chairman, Electronics Committee

George P. Luckey
Chairman, Watch and Clock Committee

T. C. O'Donnell
Chairman, Mechanical Committee

W. M. Brandes
Chairman, Instrument Jewel Bearings Committee

F. E. Ericson
Chairman, Instrument Precision Ball Bearings Committee

Hugh C. Carroll
Chairman, Proving Ground Instrumentation Committee

Divisions & Committees

The Technical Divisions and Committees of the American Ordnance Association are advisory groups organized primarily along commodity lines to serve the ordnance organizations of the Army, Navy, and Air Force and other agencies of the national-defense establishment. Additional photographs will appear in the July issue.

ARTILLERY DIVISION

J. E. Trainer
Chairman, Artillery Division

William H. Mitchell
Chairman, Gun Forging Committee

Richard F. V. Stanton
Chairman, Gun Carriage and Mount Committee

J. L. Auer
Chairman, Recoil, Recuperator and Equilibrator Committee

PACKING & PACKAGING DIVISION

Paul O. Vogt
Chairman, Packing and Packaging Division

R. F. Weber
Chairman, Light Wooden Boxes and Crates Committee

W. Gordon Bennett
Chairman, Palletizing and Loading Committee

Allyn C. Beardsell
Chairman, Corrugated and Waterproof Paper Containers Committee

John W. Kraus
Chairman, Preservation Committee

A. D. Peister
Chairman, Heavy Wooden Crates and Cases Committee

SMALL ARMS AND SMALL ARMS AMMUNITION DIVISION

C. K. Davis
Chairman, Small Arms and Small Arms Ammunition Division

F. F. Hickey
Deputy chairman, Small Arms and Small Arms Ammunition Division

Wallace L. Clay
Secretary, Small Arms and Small Arms Ammunition Division

H. A. Brown
Chairman, Rifles and Carbines Committee

George Webb
Chairman, Machine Guns, Belts and Links Committee

C. R. Hellstrom
Chairman, Pistols and Revolvers Committee

George L. Dawson
Chairman, Small Arms Ammunition Committee

Philip H. Burdett
Chairman, Caliber .50 and 20-mm. Steel Case Ammunition Committee

Harry B. Stoner
Chairman, 20-mm. Brass Cartridge Case Committee

R. C. Zeller
Chairman, 20-mm. Projectile Committee

RYAN RATES its RATE OF CLIMB INDICATORS with BOWSER TEST EQUIPMENT

Photo shows Ryan indicators under test in Bowser standard Utility Cabinet.

Ryan Industries of Detroit supplies USAF with rate of climb indicators which must meet rigid test specifications under conditions of high altitude and extreme temperatures.

Standard Bowser test units perform this all-important testing job for Ryan. Indicators are tested at temperatures from —67°F. to +160°F., at altitudes varying from sea level to 50,000 feet.

Rapid pull down time after each test run enables Ryan to deliver *more* of these vital instruments to USAF . . . each pretested under accurate flight conditions.

Why don't you take advantage of long ***continuous*** experience? Consult Bowser, the pioneer.

PROGRESS REPORT . . . Three more high altitude Walk-In test chambers are currently under construction in Bowser's enlarged plant.

BOWSER
TECHNICAL REFRIGERATION
DIVISION BOWSER INC.
TERRYVILLE • CONN.

BOWSER TECHNICAL REFRIGERATION, Terryville, Conn.
Send information on test equipment checked:

☐ High Temperature	☐ Fungus Resistance
☐ Low Temperature	☐ Rain and Sunshine
☐ Temperature Shock	☐ Sand and Dust
☐ Humidity	☐ Immersion
☐ Altitude	☐ Explosion Proof
☐ Walk-In Rooms	☐ Vapor Tight
☐ Special Engineering	1-5

Name_____ Pos._____
Company_____
Street_____
City_____ Zone____ State_____

NEW DEVELOPMENTS

MIDGET LAND MINE

A tiny land mine, so small it can be carried in the palm of the hand, yet capable of blowing the foot off any one stepping on it, will soon make its appearance in Korea. Developed by Army Ordnance, the new mine is nonmetallic and neutral in color and cannot be located by mine detectors. It costs only $2.50 to produce.

FLYING REPAIR SHOP

The Air Force's first "flying repair shop"—designed for fast, on-the-spot maintenance of complex aircraft gun sights—recently has been airlifted to the

Loading repair trailer aboard transport.

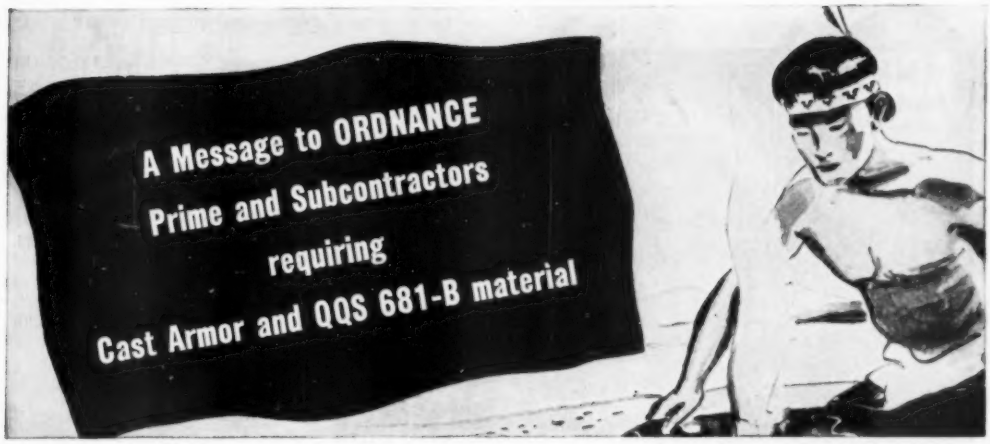
Korean fighting front. This first flying trailer heralds a new, money- and time-saving concept of "fix it in the field" for many complex aircraft systems which once had to be funneled through a long supply and maintenance pipeline for repair.

Officials in the Air Matériel Command's directorate of maintenance engineering estimate that sixty to eighty per cent of the gun sights now returned from Korea for maintenance can be restored to top working order within hours by the airborne trailer.

ANGLED-DECK CARRIER

The world's first new angled-deck aircraft carrier, H.M.S. HERMES, was launched recently in England. The angled deck enables aircraft to land without any possibility of overrunning the catapult operating positions or aircraft parked at the forward end of the flight deck. This is achieved by "jutting out" part of the flight deck so that aircraft may land diagonally at an angle of about eight degrees to the fore-and-aft line. The effect is equivalent to increasing the length of the flight deck by forty per cent. The system also makes it possible to accept more aircraft and planes of higher performance.

The United States Navy also has been



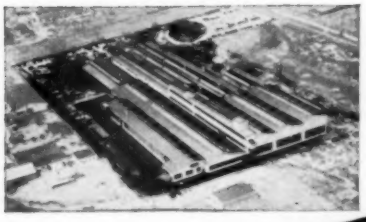
LET RIVERSIDE HELP SOLVE YOUR CASTING PROBLEMS

Riverside Foundry is ready to give you excellent service on cast armor and all types of QQS 681-B materials. *In fact, any steel casting specifications for which your contract might call.* We have a full staff of men who have spent years producing ordnance material.

Our customers include many great names of American Industry: Chrysler, American Locomotive, International Harvester, Fisher Body, Ford Motor Company, Massey-Harris, and Rock Island Arsenal. *Ask them about Riverside.*

Call or write us at Riverside today.

For a dependable qualified source of steel casting requirements, see Riverside. You give us your drawings. The rest of the job is ours. Save yourself time, worry and loss of production. We are ready to do a complete job on any casting requirement.



The big modern Riverside Foundry at Bettendorf, Iowa has the best equipment to do the best job.

Why You Should Use...
PAGE Automatic Welding Wire

• PAGE Automatic Welding Wire is made to rigid specifications which provide consistent characteristics for smooth flow of metal during continuous or intermittent welding. There are many analyses for a wide variety of uses.

for INERT GAS Welding

PAGE Stainless Steel Wire is precision thread-wound on 25-lb. non-returnable convenient reels which fit popular arc welding machines. Six Page-Allegheny grades; wire diameters: .035", .045", .0625".

for SUBMERGED ARC Welding

PAGE stainless, low alloy, and carbon steel wire in layer-wound coils, in 22" or 24" mill coils, or on 200-lb. returnable steel reels. Wire diameters from 1/32" to 5/16"; copper coated if desired.

ACCO

Write to our Monessen, Pennsylvania office for Bulletin DH-402

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Portland, San Francisco, Bridgeport, Conn.

PAGE Welding Electrodes AND Rods

experimenting with the angled deck. The first experimental carrier deck in the new design was included in the modification of the ESSEX class carrier, the U.S.S. ANTIETAM. The idea is also being incorporated into the new American carriers FORRESTAL and SARATOGA.

LIGHTWEIGHT REVOLVER

Smith & Wesson, Inc., of Springfield, Mass., is now producing a commercial series of light alloy revolvers known as the Airweight line. Newest of these is the Centennial model .38 Special with

Smith & Wesson Centennial model pistol.

enclosed hammer which weighs only 11¼ ounces. This gun also chambers any .38 Special cartridge and is claimed to be the ideal revolver for home protection or for the peace officer who must carry his revolver inconspicuously.

It features, in addition to the enclosed hammer, a grip safety which can be inactivated if desired, and a grip designed to minimize jump and recoil. Detectives can use it as a "hideout" gun, as it can be fired from the pocket in an emergency, because of the enclosed hammer.

POWERFUL PROPELLER

A new aircraft propeller incorporating the widest blades ever built has been placed in limited production by the Hamilton Standard Division of United Aircraft Corporation. When mounted on a 5,500-horsepower Pratt & Whitney T-34 turboprop engine, the new propeller will give more propulsive thrust for take-off than any other propeller-engine combination in a similar advanced stage of development, it is claimed. The propeller has been selected by the U. S. Navy for its R7V-2 turboprop version of the Lockheed Super Constellation transport, which will fly this year. Considerable performance increases of the airplane over its piston-engined counterpart are expected by the Navy and Lockheed.

The blades are of hollow steel construction supported internally by a steel core. Air spaces in the blade are filled with a vulcanized synthetic sponge for additional support of the outer shell. Designed initially for engines in the 5,000-horsepower class, the new propeller is the first of a line of propellers which, in various com-

NOW! South Wind HEATING SYSTEMS

combine these 3 benefits in one heater!

engine pre-heating

Answers needs of all types of engines, all pre-heating requirements. Heats engine components, battery, crankcase, carburetor with warm, dry air. Makes starting easier, faster—*even at 65° below!*

personnel heating

Warm air—independent of engine heat, independent of engine operation—circulates swiftly, evenly, to keep personnel comfortable at all times.

windshield defrosting

Keeps windshield reliably "frost-free." Assures clear vision, safer driving.

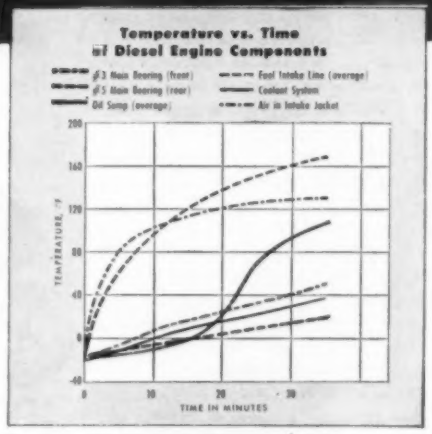
FIGURES THAT PROVE SOUTH WIND'S SUPERIORITY

Lab Tested . . . Field Tested . . . Best by Every Test!

South Wind's entirely new principle of scientific pre-heating has been developed, tested and proved in the field, as well as in the Stewart-Warner Laboratory Cold Room.

Here is a typical temperature record of critical engine components during pre-heating (only minimum capacity 70,000 BTU/hr. pre-heater kit used). This heat provided adequate temperature rise for easy starting—with less than 5-seconds cranking.

Data is based on a 6-cylinder, 2-cycle, 225 HP Diesel engine, weighing 3,000 pounds.



Compact, powerful, dependable Stewart-Warner "South Wind" pre-heating systems are first choice of engineers and maintenance men for these reasons:

1. Provides quick starting required by Military Services—even at 65° below.
2. One heater provides engine starting, cab heating and defrosting.
3. Provides only clean, *dry* hot air to engine.
4. Permits use of optimum viscosity lubricants.
5. Normal lubrication at all times.
6. Lowers engine maintenance cost—prolongs engine life.
7. Reduces battery drain by reducing starting torque.
8. Eliminates cost of expensive starting aids.
9. Eliminates shock loads imposed by brute force starting methods.
10. Inhibits sludge formation and freeze-up of engine accessories.

There's a South Wind Heater for Every Pre-Heating Need

Do You Have A Heating Problem? Write today for the experienced counsel of South Wind field engineers about *any* problem in external or internal pre-heating. The wide range of South Wind Heaters includes 20,000 – 30,000 – 50,000 – 100,000 – 200,000 and 600,000 BTU/hr. capacities. Write South Wind Division, Stewart-Warner Corporation, Indianapolis 7, Indiana.

South Wind

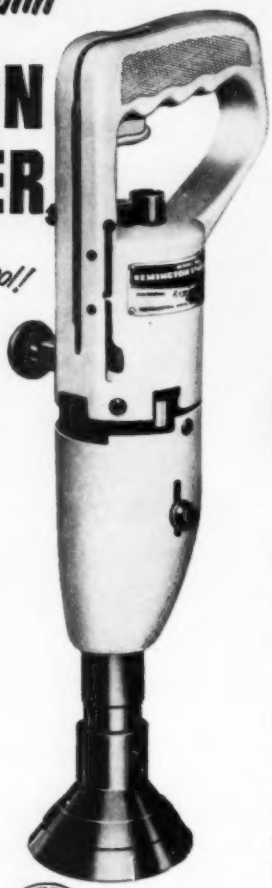
A PRODUCT OF SW STEWART WARNER

PERSONNEL HEATING
ENGINE AND
EQUIPMENT PRE-HEATING
WINDSHIELD DEFROSTING

You can drive studs ARROW STRAIGHT into steel or concrete with

MODEL 450 REMINGTON STUD DRIVER

The widest power range of any powder-actuated tool!



The long heel cap on all Remington cartridges insures consistently straight driving on every type of fastening job. It acts as a perfect gas seal and provides extra power. These colored heel caps clearly mark the six different 32-caliber power loads that are available. You can select the *right* cartridge for each job quickly and easily.

The Remington Stud Driver needs no separate parts for power control or loading—nothing to lose or break. Just a twist of the wrist opens the Model 450. Insert stud and power cartridge as a unit . . . close and you're ready. Triple safe, this superior tool has a separate lever that must be depressed and *held* with one hand before and during squeezing of the trigger with the other hand. Two *additional* devices prevent operation except in proper fastening position.

The Model 450 sets up to 5 studs per minute in fastening steel or wood structural pieces to concrete or steel surfaces. Its light weight—only 5½ pounds—makes it ideal for use overhead or in confined spaces. To speed operation further, an exclusive ejector snaps the fired case out of the tool instantly—no fumbling, no tools needed.

Test-proved to be the world's finest and speediest fastening system, the Model 450 Remington Stud Driver is made by Remington Arms Company, Inc., *America's oldest sporting arms manufacturer.*

Listed & Approved by Underwriters' Laboratories, Inc.

"If It's Remington—It's Right!"

Remington

DU PONT

NEW, FREE BOOKLET shows you a hundred different ways the Model 450 Remington Stud Driver can speed *your* construction fastening. Packed with illustrations, it tells you where and how this tool can save time, reduce fatigue and cut costs. Send in the coupon for your copy.

MAIL THIS COUPON TODAY

Industrial Sales Division 0-5
Remington Arms Company, Inc.
939 Barnum Ave., Bridgeport 2, Conn.

Please send me my *free* copy of the new booklet showing how I can cut my fastening costs.

Name.....

Position.....

Firm.....

Address.....

City..... *State*.....

binations of numbers of blades, can be adapted for engines of more than 9,000 horsepower and airplane speeds of more than 500 miles an hour. It is expected to see wide use on the military and commercial transports of the future.

LOW-COST "ROBOT BRAIN"

The first low-cost "robot brain" electronic computer available commercially for general use has been accepted by Army Ordnance officials at Aberdeen Proving Ground after it successfully completed sixty hours of grueling nonstop tests. Making errorless computations at the rate of 1,700 a minute, this practical size computer established a record unmatched in accuracy. Known as the Elecom 100, the machine made 4,212,000 computations without a single mistake in the first 42 hours of operation.

The Elecom computer in action.

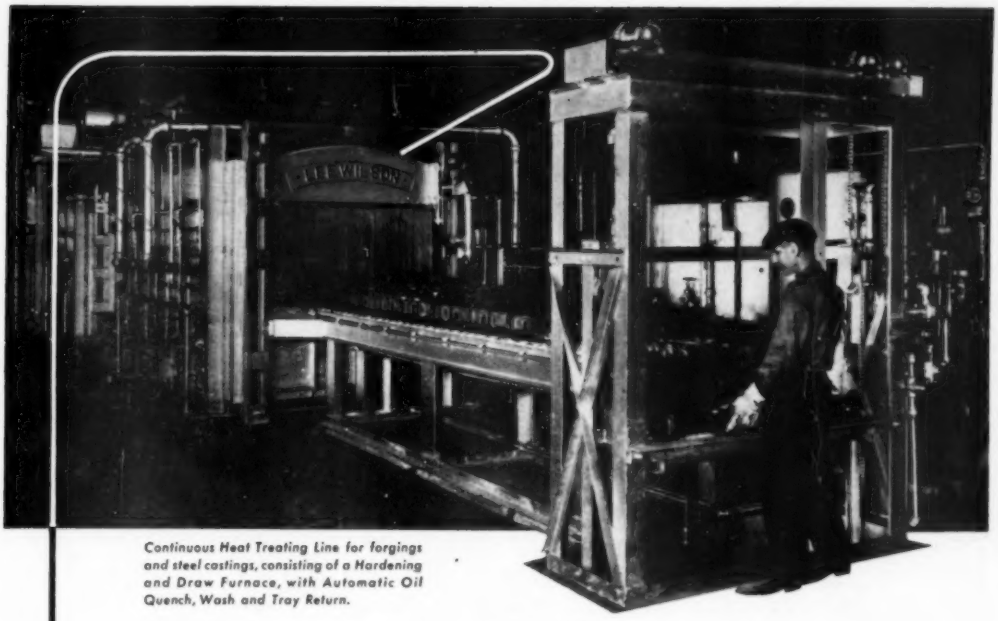
NEW MAGNETIC MATERIAL

A new "soft" magnetic material composed of noncritical metals has been developed in the Magnetics Division of the Naval Ordnance Laboratory, White Oak, Md. Named 16-Alfenol, the new material is—as its name indicates—composed of sixteen per cent aluminum and eighty-four per cent iron. The alloy itself is not new, but due to the extreme hardness and brittleness of the metal it could not be rolled in sheets efficiently.

However, the Naval Ordnance metallurgists finally developed a method for cold rolling the alloy at 575 degrees centigrade and found that it could be formed into thin tapes showing the desired magnetic properties.

Furthermore when the researchers got these thin strips, only a few thousandths of an inch thick, they found that the alloy had become tougher and more ductile. The metal tapes showed isotropic magnetic properties and a high bulk resistivity which prevented electrical losses. It furthermore "grew" its own insulating layer when rolled, which in some magnetic applications would mean that one step in the fabrication process could be eliminated.

The Alfenol strips are lighter in weight



Continuous Heat Treating Line for forgings and steel castings, consisting of a Hardening and Draw Furnace, with Automatic Oil Quench, Wash and Tray Return.

THE IMPORTANT STORY IS **BEHIND** THIS PICTURE...

"HUNDREDS OF ENGINEERING YEARS" OF FURNACE KNOW-HOW

MODERN INDUSTRIAL FURNACES FOR GAS, OIL, ELECTRIC HEAT TREATMENT OF...

Armor Plate
Armor Piercing Shot Bar
Gun Barrels, Mounts, Breech Blocks
Recoilless Rifle and Mortar Tubing
Aircraft Jet Parts
Bullet Core Rod
Artillery Shells
Tank Turrets—Hulls—Race Rings
Propellers—Aluminum Alloy or Alloy Steel
Landing Gears—Airframes
Steel Casting Annealing

ALUMINUM HEAT TREATING INCLUDING

Homogenizing furnaces
Preheating furnaces—Reheat furnaces
Solution furnaces
Ageing and Annealing furnaces—ovens
Heat Treating furnaces for Dies, Mandrels, Backers
Form Die Quenching

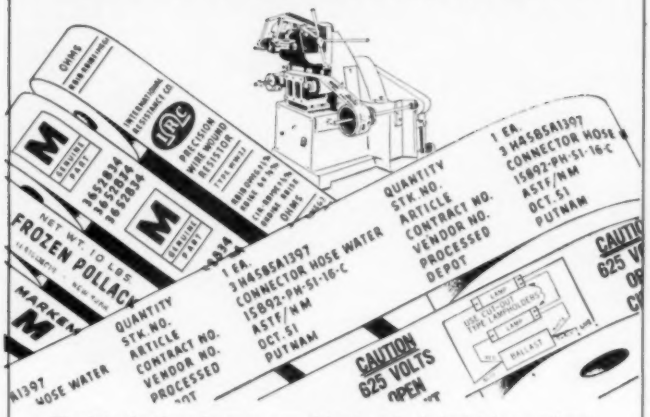
In the "Minds of Men" are created the engineering designs for the custom building and erection of modern heat treating furnaces and auxiliary equipment. This is the important story behind any furnace installation. The Lee Wilson Contracting Company using the Designs and Patents of Lee Wilson Engineering Co., Inc. has combined experience in design and erection totaling "hundreds of engineering years" at your disposal. We cordially invite your request for bids or expression of interest.

LEE WILSON
Contracting Company

20005 WEST LAKE RD. • CLEVELAND 16, OHIO

MARKEM SOLVED THIS MARKING PROBLEM

PRINTING LABELS
ON PRESSURE SENSITIVE TAPE



The introduction of pressure sensitive tape for industrial uses offered many advantages if *label* data could be printed on the tape *in the plant itself when needed*. Markem developed methods that permit printing of stock number, part number, trade mark or other designation on this tape. Label inventory problems are thus eliminated. Manufacturers can now print the exact number of labels required . . . readily changing variable information or color of ink when desired. The Markem method used includes a Markem machine which makes up to 85 imprints per minute, rewinds the roll of tape automatically, and shuts itself off after a selected number of imprints. Thus Markem has provided industries of all types with a more modern, more attractive and less expensive means of labeling.

MARKEM MARKS THEM ALL

CAN MARKEM HELP YOU? Printing labels on pressure sensitive tape is but an example of how Markem solves industry's marking problems. Markem has been providing industry with production techniques and equipment to identify, decorate or designate its products, parts and packages since 1911. Markem also provides technically trained men who are available in your area to assure *continued* satisfaction with Markem methods and equipment.

When *you* have a marking problem, tell us about it and send a sample of the item to be marked. Perhaps a complete Markem method has already been developed to solve your problem. If not, Markem will work out a practical solution.

Markem Machine Company, Keene 9, N. H., U. S. A.

MARKEM ... TO MAKE YOUR MARK

than are many of the materials showing similar properties and, in certain applications, should do a better job than the materials now used. For instance in transformer cores, like those used in high-frequency communications instruments, Alfenol shows properties superior to those shown by silicon iron now widely used.

VIBRATIONS MEASURED

A vibration-measuring instrument of unusually small size was announced recently by Consolidated Engineering Corporation. In addition to its compactness—

Pickup unit compared with postage stamp.

it measures only 1 by 1 inch and weighs only 1.3 ounces—the pickup is designed for operation at the elevated temperatures encountered in testing aircraft turbines, reaction motors, and superchargers. It can operate continuously at 300 degrees Fahrenheit or as high as 500 degrees for intermittent periods of up to 100 hours.

BAZOOKA TESTER

A pocket-sized instrument, produced by the General Electric Company's Meter and Instrument Department at Lynn, Mass., is aiding proper operation of the Army's famed antitank weapon, the bazooka. Called a "bazooka tester," the device is used by soldiers to check the firing mechanisms of the rocket-launching weapons before they are placed in action. It is carried as standard equipment by the various military units which operate bazookas.

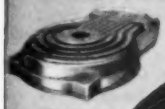
The specially designed portable instrument indicates faulty firing mechanisms which do not develop sufficient electric energy to fire the fuze of a rocket. Originally developed by the Rock Island Arsenal, the bazooka tester was recently transferred to General Electric where it was improved and manufactured in quantity.

POWER MEGAPHONE

A portable self-contained power megaphone weighing 5½ pounds with an ef-

SPECIALISTS IN METAL STAMPINGS

FOR OVER 70 YEARS


Base For Power Lawn Mower

G.P.&F.®

Solenoid Cover U.S. Navy

Aerial Delivery Container U.S. Air Force

Radio Case—U.S. Signal Corps

means...

Greater Production Facilities

... for your requirements of deep-drawn and stamped metal parts

Over 1000 skilled people ... 289 deep draw and stamping presses ... 92 welding machines ... 15 acres of production facilities ... complete tool and die department.

Washing Machine Tub

Scale Platter

Safety Guard for Power Tools

Vacuum Cleaner Parts

STAMPING • DRAWING • FORMING
TINNING • GALVANIZING • WELDING
LEAD COATING • SPRAY FINISHING
VITREOUS ENAMELING

Longhorn Cheese Mold

Commercial Fruit Juicer

Deep Fat Fryer Pot

Transmitter Case

Cover for Ice Cream Freezing Equipment

Christmas Tree Stand

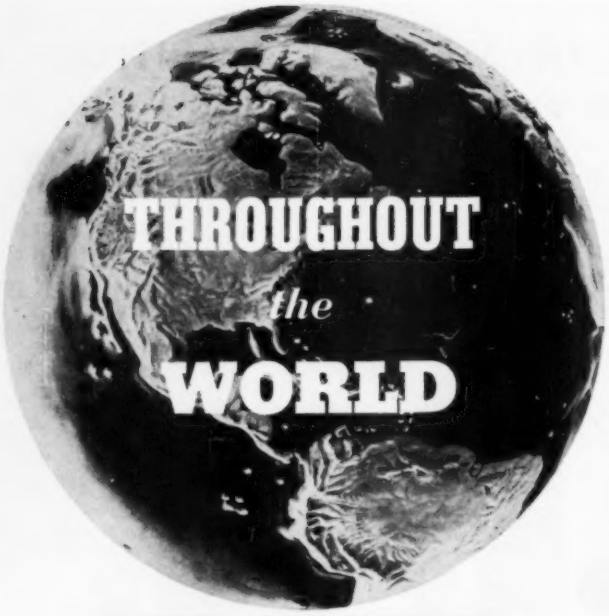
Fuel Tank

Gas and Water Cans U.S. Quartermaster

G.P.&F. SINCE 1880 MILWAUKEE

GEUDER, PAESCHKE & FREY CO.

1327 W. ST. PAUL AVENUE • MILWAUKEE 1, WISCONSIN



PEABODY
ENGINEERING CORPORATION

the
Name Plate of EFFICIENCY

BURNERS
DIRECT FIRED AIR HEATERS GAS SCRUBBERS and COOLERS

ARGENTINA — AUSTRALIA — BELGIUM — BRAZIL — COLUMBIA
CUBA — CANADA — CHILE — DOMINICAN REPUBLIC — EGYPT
FRANCE — GREAT BRITAIN — GUATEMALA — HAITI — ICELAND
INDIA — IRAN — IRAK — SPAIN — KUWAIT — PHILIPPINE ISLANDS
MEXICO — NORWAY — PANAMA — PERU — SAUDI ARABIA — SWEDEN
SOUTH AFRICA — VENEZUELA

PEABODY
ENGINEERING CORPORATION
580 FIFTH AVENUE • NEW YORK 36, N. Y.
Manufacturers of all types of combustion equipment, direct-fired air heaters, gas scrubbers, coolers, and absorbers.

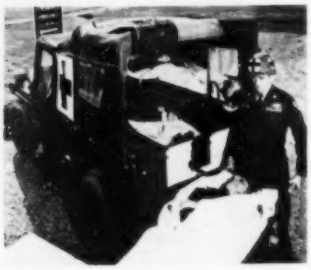
OFFICES IN PRINCIPAL CITIES
PEABODY LIMITED • LONDON, S.W.1, ENGLAND

228

fective range of one-quarter mile was announced recently by Austin-Lee, Inc. The new megaphone has wide uses for disaster control, fire fighting, security, and police operations. The complete unit is only 11 inches high, the horn is 9½ inches in diameter and operates on 6 standard flashlight batteries. It has instant trigger action. Its use is especially adapted to military operations, particularly rescue work, guerrilla warfare, amphibious landings, and airport use.

JEEP AMBULANCE

A jeep ambulance, designed especially for front-line duty over rough terrain, will soon go into production. The Army has been testing two pilot models of the vehicle which Army Ordnance developed



The jeep ambulance.

for use where the going is too rugged for conventional ambulances and to improve on the evacuation of wounded men from such areas by the regular jeep.

With a larger wheelbase (one hundred inches instead of the standard eighty-one inches), the jeep ambulance has an extra-long body with ample space for litters. It can accommodate three litter patients or two litter and as many as four ambulatory patients and still allow room for a medical attendant so that medical care can be administered en route. The entire vehicle is enclosed and has a forced-air heater, providing complete weather protection.

Since the parts used in its manufacture will be ninety-six per cent interchangeable with other jeeps used by the military, the new ambulance will produce no appreciable maintenance problems. In fact, the ambulance will come off the same Willys-Overland assembly lines that are currently turning out the military jeep.

NEW "DOSIMETER"

The new, inexpensive, accurate "dosimeter," a device which measures the total amount of gamma or X-radiation to which its wearer has been exposed, has been recently perfected by the Navy. The device weighs less than an ounce and is

★★★★★ **for domestic or export shipment...**

★★★★★ **for light or heavy products...**

★★★★★ **for large or small objects...**

there's a General engineered shipping container to meet military packing needs!

Pictured here is a General Wirebound box for the export shipment of 50-caliber ammunition. It combines strength and light weight. It is one of many types made by General —to meet military needs. Remember General when you have a military packaging problem. Container experts will be glad to design a package for your product, or help you with various specifications.

Write for your **FREE** *Copy of "The General Box." It shows how to cut packing and shipping costs.*

General ★★★★★ **BOX COMPANY**

GENERAL OFFICES:
1865 Miner Street, Des Plaines, Ill.

DISTRICT OFFICES AND FACTORIES: Cincinnati, Denville, N. J., Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, Sheboygan, Winchendon, General Box Company of Mississippi, Meridian, Miss., Continental Box Company, Inc., Houston, Dallas

ENGINEERED SHIPPING CONTAINERS FOR EVERY SHIPPING NEED

- Wirebound Crates and Boxes
- Generalift Pallet Boxes
- Generalite Beverage Cases
- Cleated Corrugated and Watkins-Type Boxes
- All-Bound Boxes
- Corrugated Boxes

worn on a dog-tag chain or belt clip. Its accuracy is about twenty per cent for a wide range of radiation. Its diameter and its cost are less than a silver dollar and it will last longer than the man who wears it. The instrument will pick up and accumulate, even after many readings. Its principle—the more radiation, the more fluorescence.

SELF-LUMINOUS MARKERS

The United States Radium Corporation has recently developed self-luminous markers using strontium-90 as the radioactive phosphor. Used for both self-luminous deck and personnel markers by the Navy, the phosphor has proved to have longer useful life and greater brightness values than radium markers and has greatly reduced health hazards. Extending the usefulness of such markers in night operations, the strontium markers can be manufactured at present in all colors except red.

NEW PLATING PROCESS

A new and economical method of chemically depositing nickel coating on parts of any size, shape, and almost any material has recently been announced by the General American Transportation Corporation. This continuous nickel coating is said to protect against corrosion, abrasion, and wear. It can be deposited uniformly, in thicknesses which can be controlled to within ten per cent of the thickness of the plating, regardless of the shape of the piece plated—an impossibility with any other type or method of plating. Because it has greater coating efficiency, it stretches the available supply of nickel. This revolutionary process would appear to have few limitations and may open up new fields in fabricating as well as finishing, it is said.

GAS TURBINES FOR SHIPS

The British Navy is now testing out gas-turbine marine engines that will power superfast warships as a form of overdrive. Britain has recently let the U. S. Navy have prototypes of two gas-turbine engines. A British tanker with a gas-turbine engine has already crossed the Atlantic several times.

According to Adm. Sir Michael Denny, Britain's Third Sea Lord and Controller of the Navy, "Important decisions concerning the future of the gas turbine in the Royal Navy have been made. . . . In the near future gas turbines will be found in all classes of vessels in some form or other. Smaller ships will undoubtedly have gas-turbine propulsion, and gas turbines may well be fitted in aircraft carriers, cruisers, destroyers, and frigates as boost sets for use when the full power for which the ship is designed is required."

Cutting Tool Center

"YES . . . WE'VE GOT THOSE TAPS IN STOCK"

That's your INDUSTRIAL DISTRIBUTOR talking. Many a time, no doubt, you've heaved a sigh of relief when you've heard the welcome words, "Sure we've got 'em", or when you need service, "We'll send Jack right over".

And your GTD-GREENFIELD Distributor also has direct friendly contact at the factory with men he knows well, regarding non-stocked items or special tools.

Yes, it will pay you to get better acquainted with your GTD-GREENFIELD Distributor. Stop shopping around . . . stop buying the hard way.

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASS.

Buy From

GTD

TAPS

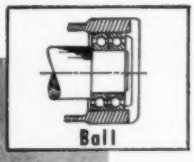
DIES

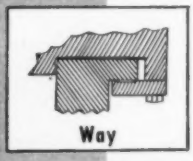
GAGES

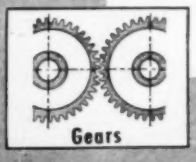
YOUR *Friendly* INDUSTRIAL DISTRIBUTOR

CONTROLLED *lubrication*

for SIMPLE MECHANISM or COMPLEX MACHINE







Whether your machine has one type or many types of bearings—all can be accurately lubricated with Bijur Centralized Systems.

From ball bearing to table way, from needle bearing to gib—every important surface receives just the *right amount* of oil at the *right time* — truly *controlled* lubrication.

Bijur Automatic Metered Lubrication is standard equipment on machines of hundreds of leading manufacturers. Bijur engineers can design a complete Bijur system as an integral part of your machines now in production as well as for your new models.

For recommendations covering the selection of lubricators or specification and arrangements of distribution systems for your equipment, call in a Bijur engineer.

N-1

—BIJUR—

LUBRICATING CORPORATION

Pioneers in Automatic Lubrication

Bochelle Park, New Jersey

FROM THE RECORD

AIR WEAPONS SYSTEMS

MAJ. GEN. DONALD L. PUTT

Vice Commander, Air Research and Development Command, U.S.A.F.

During World War II the British invented, developed, and employed a technique which became known as operational analysis. This technique was a form of systems analysis where evaluation (employing theories of probability, statistical analysis, and other techniques) was made to determine how best to employ the weapons, equipment, and personnel available so that these ingredients would be most effectively used to accomplish an assigned military mission.

The British wished to know, for example, how best could their bombers be used to destroy the maximum number of enemy targets, in the shortest possible time, with the least loss of life and matériel, and at the most economical cost. A simple but specific illustration of the systems aspects of this kind of analysis can be given by explaining the operational analysis which led to the elimination of deicing equipment on British bombers.

Recognizing that the problem was to deliver the maximum tonnage of bombs on the target, an analysis of the complete bombing operation was made. Since carrying unnecessary equipment decreased the bomb load carried on any one trip (and increased the number of trips required to destroy any given target, thus further exposing aircraft and crews to enemy action) the operational analysts determined the probability of loss of aircraft and crews by virtue of encountering severe icing and then evaluating this possibility against the decrease in the number of trips that would have to be made for the destruction of the given target.

It was discovered that there would be less loss of life and aircraft if the deicers were removed from each individual aircraft.

You can appreciate that removing the deicers was not a very attractive action to each individual pilot or crew member who was going to have to fly the bomber. On the basis of the evaluation of the individual bomber (one with deicers and one without deicers) any pilot, and perhaps most engineers, knowing that icing would be encountered at some time or other would probably say that the airplane with the deicers was the better one.

However, when the complete system was evaluated on the basis of the task to be performed, it was quite evident to the British that they should remove deicing equipment from their aircraft. . . .

A VITAL FORCE IN NATIONAL DEFENSE

Chrysler Airtemp

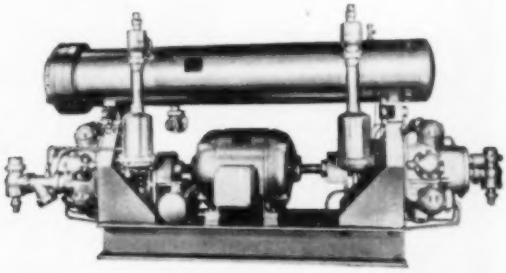
CHRYSLER AIRTEMP
DIVISION OF CHRYSLER CORPORATION
A VITAL FORCE IN NATIONAL DEFENSE

"Packaged" Air Conditioner
Easily installed. Cools, dehumidifies, filters, circulates, ventilates. Six models 2 to 15-H.P. capacities—to meet most cooling needs.

Machine Tool Coolant Cooler
Keeps coolants in automatic machine tools at a constant temperature. Helps provide greater precision, higher production. Reduces friction heat.

Chrysler Airtemp has won recognition as an outstanding factor in the national defense effort. By waging war against enemies of production, precision and perishables: uncontrolled dust, humidity and temperatures—Chrysler Airtemp is making a major contribution to the armament program. On all fronts—at home and abroad—in assignments that cover every application of temperature and humidity control, Chrysler Airtemp is serving with distinction. A complete range of products enables Chrysler Airtemp to provide the answer to production problems involving control of indoor atmospheric conditions.

Room Air Conditioner
Fits in window, cools, filters and circulates fresh outside air. Ideal for offices, hospital convalescent rooms, workshops or other small areas.



Central Station Unit
For large installations. This unit forms the heart of many air conditioning, cold storage and other temperature and humidity control systems.

Chrysler Airtemp

HEATING • AIR CONDITIONING
for HOMES, BUSINESS, INDUSTRY

Airtemp Division, Chrysler Corporation, Dayton 1, Ohio

GET THE
FEATURE
FACTS
SINGLE ROW
B SERIES
FEATURE FACTS
* Spherical inner race—a basic Shafer feature—insures minimum roller movement across inner race under misalignment.
* Simple, rugged, compact construction. Full complement of rollers. No retainer. One piece inner and outer races.
* 20° integral self-alignment with inner race shoulders providing positive alignment stops.
* High radial load capacity. Rollers and races of S.A.E. 52100 steel, through hardened for maximum reserve shock load capacity.
* Self-aligning, self-wiping, free running positive contact seals.
* Exposed bearing surfaces cadmium plated. Stainless steel external seal plates.
* Pre-lubricated—outer race grooved and drilled for easy relubrication.
SHAFER
SELF-ALIGNING
Aircraft Bearings

From the Record

In the days when warfare was simple, our weapons simple, and development and production costs relatively low, we could afford to use the "shotgun" or multiple approach to the development of our weapon systems. Today, because of high costs and complexity, we must analyze the many alternate approaches or alternate systems for each particular military mission in order to determine which system warrants development.

For instance, today we are faced with choosing between piloted aircraft and guided missiles for the performance of some of our military missions. Which weapon, considering the time period in which they will be available for operational use, will provide us the most lethal system at least expense?

Not only must we choose between two different types of weapons, such as guided missiles or piloted aircraft, we must also choose among several guided missiles. We must choose among several forms of propulsion.

Shall it be ramjet powered? Shall it be rocket powered? Shall it be powered with conventional turbojet engines?

All such important decisions must be made if we are to arrive at a proper selection. Such selections can only be made on the basis of an analysis of the operation of the complete weapon system. Selections cannot be made on the basis of a performance comparison of the mere weapons themselves.—*From an address before the Annual Meeting of the Society of Automotive Engineers.*

RESEARCH FOR DEFENSE

Dr. Alan T. Waterman
Director, National Science Foundation

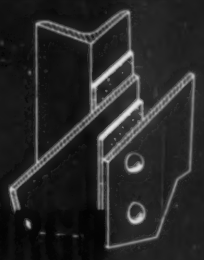
The universities should be in the position of making studies and reports and then withdrawing from the field of concentrated application. Instead, however, we find that military problems are occupying an increasing share of the universities' research scientists and facilities.

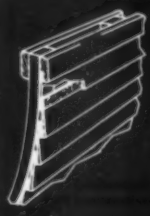
This brings us to a situation which has become a matter of national concern. In recent months a number of educators and scientists have begun to assay the effects of large-scale research and development programs upon the universities and are asking whether the universities' traditional rôles of research and teaching are being threatened.

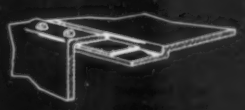
Having myself been concerned with the military research picture during the war and before the National Science Foundation was established, I should be the first to admit that there are indeed a number of complex problems in military research for which university coöperation is highly necessary. Still, I believe that the time has come when we should consider very carefully the degree to which our educational institutions are called

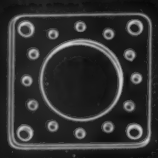
For better insulation . . . weat[illegible] waterproofing . . . and resista[illegible] galvanic corrosion . . . . . use PITTSBURGH

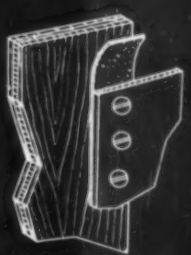
NU-CHROMSEAL TAPE











MORE AND MORE production executives in many industries are turning to Pittsburgh's Nu-Chromseal Tape to seal lap joints or butt seams in metal, wood or fiber, where rivets, bolts or screws are used.

● **Nu-Chromseal Tape** is a solid, pliable compound of fixed width and thickness of unusual versatility. It can be used for weatherproofing of roof and side panels of motor buses; for caulking around fender-to-body seams of motor cars; in various seams of marine craft, for sealing water, gasoline and oil storage tanks; and as a galvanic insulator between dissimilar metals to prevent corrosion. It is also an excellent anti-squeak or anti-chafe medium between wood or metal members which have a tendency to rub.

● **Nu-Chromseal** is gently adhesive so that it can be readily applied under rapid production conditions. It can be used on units where baking temperature runs as high as 375 degrees, without bleeding or materially changing in character. Its pliable consistency permits easy tailoring—excess material can be readily trimmed.

Pittsburgh also offers WELDSEAL and FABSEAL Tapes

● **Weldseal** Tape protects spot-welded and hot-riveted assemblies from corrosion by sealing seams against moisture.

● **Fabseal** Tape is an impregnated fabric that forms a complete seal between wood, metal or fiber members.

Samples of these remarkable tapes are available on request for experimental work. Our engineers will be glad to consult with you without charge or obligation.

PITTSBURGH PLATE GLASS COMPANY—Industrial Paint Division; Pittsburgh, Pa. Factories: Milwaukee, Wis.; Newark, N. J.; Springdale, Pa.; Atlanta, Ga.; Houston, Texas; Los Angeles, Calif.; Portland, Ore. Ditzler Color Division, Detroit, Michigan. The Thresher Paint & Varnish Co., Dayton, Ohio. Forbes Finishes Division, Cleveland, Ohio. M. B. Suydam Division, Pittsburgh, Pa.

PPG **PITTSBURG[illegible]**

PAINTS • GLASS • CHEMICALS •

PITTSBURGH PLATE GLASS COMPANY

Now! . . . use the

Most Advanced

All Electric Typewriter ever built

All eyes are on this exciting, fast-writing, UNDERWOOD ALL ELECTRIC!

Most Advanced
Design and Style
more beautiful than ever . . . perfect in every way!

Most Advanced
Keytops
. . . new . . . Finger-Flite . . . for comfort, speed and smooth, s-m-o-o-t-h touch!

Most Advanced
Scales and Indicator
. . . for *instant* paper centering, heading centering and carriage positioning.

—And it's More Beautiful than ever!

Most Advanced
Margin Set
electrically . . . from the keyboard. What a convenience!

Most Advanced
Keyboard
. . . scientifically designed to minimize finger reach!

Most Advanced
Functional Keys
. . . color-controlled . . . for ease and accuracy. A big advantage!

Yes, Underwood leads again!

Leads in all the basic features that encourage speed, accuracy and ease of typing! Leads in bringing you the *Most Advanced* All Electric Typewriter *ever* built!

Get a demonstration from your local Underwood representative . . . and see for yourself!

Underwood Corporation

Typewriters • Adding Machines • Accounting Machines • Carbon Paper • Ribbons

One Park Avenue New York 16, N. Y.

Sales and Service Everywhere

Copyright—Underwood Corporation

UNDERWOOD

Underwood *All Electric* Typewriter

. . . made by the Typewriter Leader of the World

From the Record

upon to contribute to practical problems of science.

Within the short space of ten years we have witnessed the phenomenon of the science departments of our universities gradually being drawn into research and development for practical ends. The problem is not so acute, perhaps, if the research undertaken is reasonably compatible with the research activities of the universities and can be accomplished without major dislocations in either the research or teaching programs.

In a number of instances, however, the demands upon universities for this kind of work have become so numerous and the magnitude of the work so great that it has been deemed necessary to separate this type of activity from the educational core of the university.

Some laboratories for this purpose are even apart in geographic location from the university proper. This arrangement has the advantages of separating work of a practical nature from the educational program which is largely concerned with fundamentals of science. It also makes possible easier recruitment of personnel, etc.

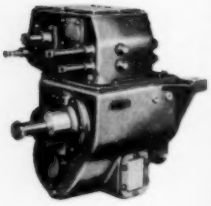
However, it creates other problems, chief among which are: the employment of substantial numbers of research scientists and technicians without teaching or educational responsibilities; the diversion of graduate students from their normal study into special research activities related to defense or other Federal interest; and a host of new problems related to academic salary and tenure, summer work, and possible competition with industry. The last can arise from a feeling that it is easy for such a research establishment also to handle industrial research problems.

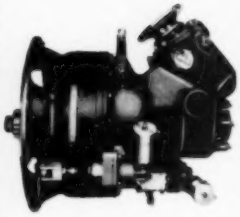
What to do about the situation has become a major question. Obviously the national security comes first, and all the research and development that can effectively contribute to that end should be done.

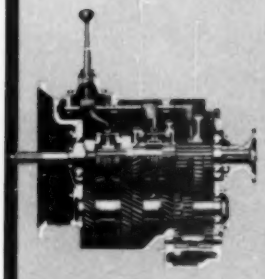
Nevertheless it may be pertinent to ask whether, in fact, the huge sums presently being appropriated directly for military research and development have taken adequate account of the need for advancing the frontiers of science and for training young scientists. . . .

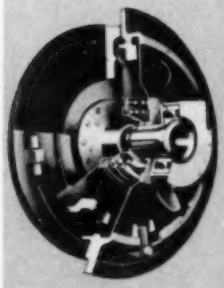
Both the universities and the Federal Government should critically examine the question whether all the research that the universities are being asked to do is properly the kind of research that belongs in the universities, or whether some of it might not more properly be carried on in service laboratories or by industrial organizations.—*From an address before the Southwestern I.R.E. Conference, San Antonio, Tex.*

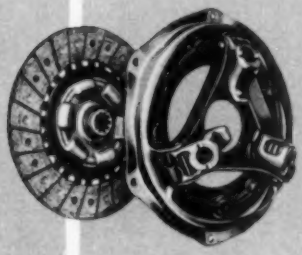
ME
award to the wise!
Again . . . in 1952 . . . 100% of the winners in the Bus Transportation Maintenance Efficiency Contest used Spicer-equipped vehicles!
Year after year, this outstanding Spicer performance in the bus field is repeated. Spicer service records are noteworthy year after year in every field of automotive duty. They are the result of nearly a half-century of uninterrupted engineering and manufacturing progress.
Designing, Developing, Engineering, Manufacturing and Service
Spicer





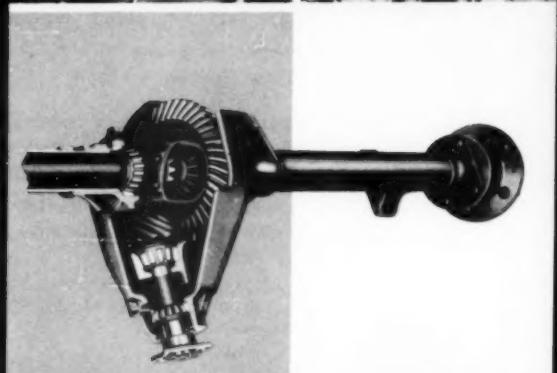






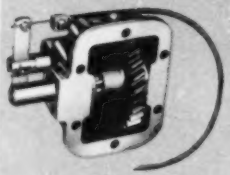
Billions of people moved faster, easier because of Spicer

Spicer furnishes high-precision equipment for practically every power-transmission need in automobiles, buses, trucks, tractors and other civil and military vehicles. With its ten modern production plants . . . and its skilled personnel in every department . . . Spicer can serve you fully, completely, dependably.



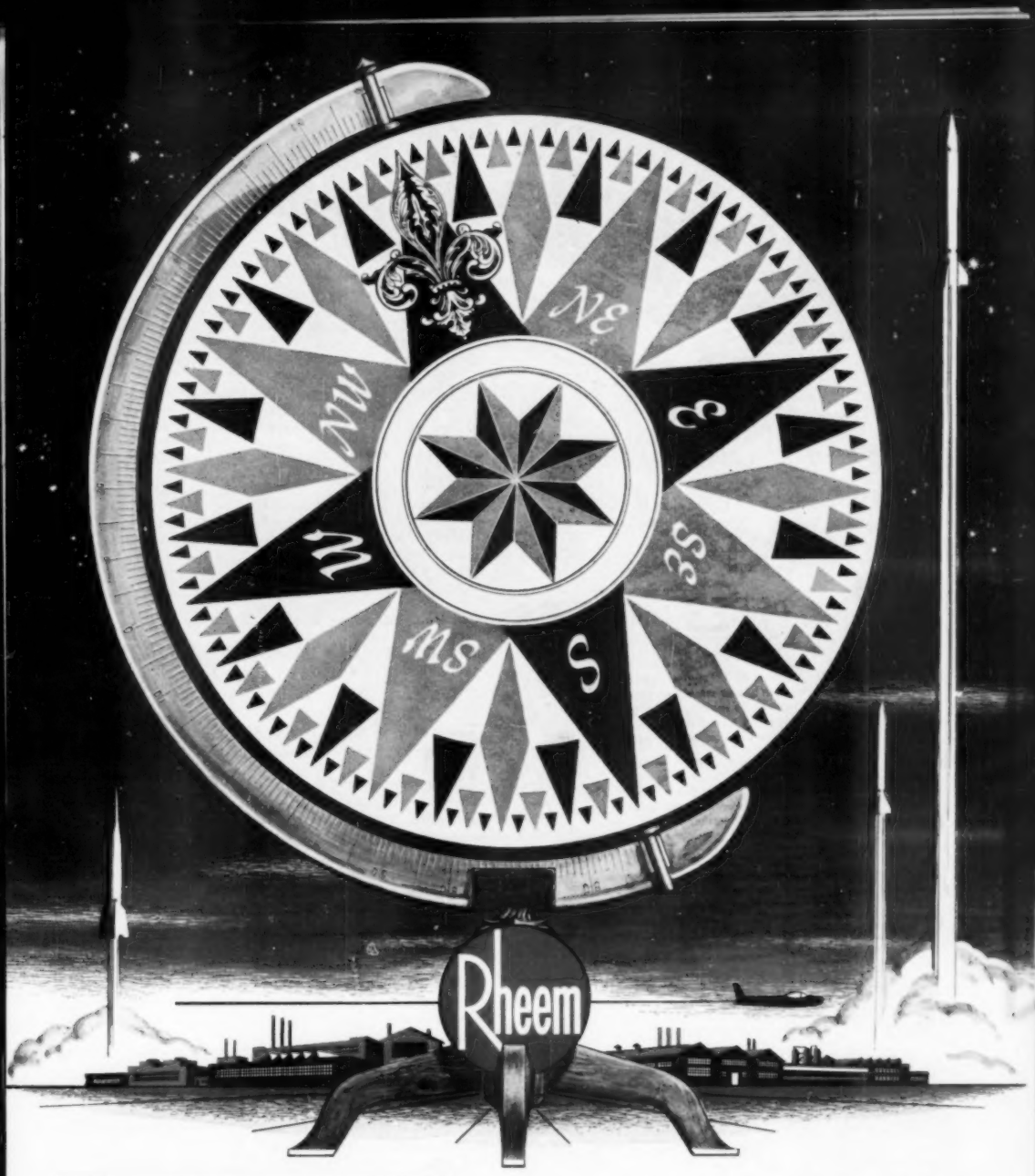
49 YEARS OF
Spicer
SERVICE

ENGINEERING
DANA
MANUFACTURING



SPICER MANUFACTURING DIVISION
of Dana Corporation • Toledo 1, Ohio

TRANSMISSIONS • UNIVERSAL JOINTS • BROWN-LIPE AND AUBURN CLUTCHES • FORGINGS • PASSENGER CAR AXLES • STAMPINGS • SPICER "BROWN-LIPE" GEAR BOXES • PARISH FRAMES • TORQUE CONVERTERS • POWER TAKE-OFFS • POWER TAKE-OFF JOINTS • RAIL CAR DRIVES • RAILWAY GENERATOR DRIVES • WELDED TUBING



American progress in aviation is respected wherever the compass points

America's achievements in the world of aeronautics have built an enviable reputation that reaches to the four corners of the earth.

A prime factor in building this global reputation has been persistent research for better materials . . . better fabrication . . . and better production methods.

To Progress through Research is a constant in Rheem development and manufacturing. Our facilities are available.

RHEEM—Aircraft Division, Downey, California . . . Research and Development, Whittier, California

Industrial fastenings of the highest quality and utility

EATON

SPRINGTITES and SEMS

ONE UNIT — Washers of all types pre-assembled on bolt or screw automatically eliminate double requisitioning, purchasing and stocking . . . assure an ever balanced inventory.

SAFER — Pre-assembled washers are always correct size and design. Danger of faulty fastenings due to wrong size or type washer is eliminated. This assures product protection.

FAST — Eaton Springtites and Sems are easy to use in hard-to-get-at places. Can be hopper fed for automatic screw driving allowing greater production in less time.

ENGINEERED — Only carefully, inspected, specification approved washers are pre-assembled on screws or bolts. Washers rotate and function freely to permit tighter tightening torque.

ECONOMICAL — Eaton Springtites and Sems are economical to buy, and offer possibilities of high dollar savings by elimination of slow and costly hand assembly techniques.

SEND FOR FREE ENGINEERING FOLDER S-49

EATON RELIANCE DIVISION

EATON MANUFACTURING COMPANY

Office and Plants: 310 Charles Street, Massillon, Ohio

Sales Offices: New York • Cleveland • Detroit
Chicago • St. Louis • San Francisco • Montreal

Book REVIEWS

Review Staff

BRIG. GEN. DONALD ARMSTRONG, *military historian, lecturer, author, Washington, D. C.*

COL. JOHN D. BILLINGSLEY, *educator, ordnance authority, author, United States Military Academy, West Point, N. Y.*

COL. GEORGE S. BRADY, *consulting engineer, author, editor, Washington, D. C.*

COL. JOHN J. DRISCOLL, *author, air armament engineer, air combat officer, NATO, Paris, France.*

F. W. FOSTER GLEASON, *military historian, ordnance analyst, editor, Washington, D. C.*

COL. CALVIN GODDARD, *small-arms authority, military historian, author, Washington, D. C.*

LIEUT. COL. MELVIN M. JOHNSON, JR., *automatic arms expert, inventor, author, New Haven, Conn.*

DR. ARTHUR F. MACCONOCHIE, *educator, mechanical engineer, ordnance authority, University of Virginia, Charlottesville, Va.*

BRIG. GEN. EDWARD P. MECHLING, *air armament engineer, administrator, author, Eglin Air Force Base, Fla.*

DR. JOHN J. O'CONNOR, *educator, author, editor, Washington, D. C.*

COL. PHILIP SCHWARTZ, *author, ordnance expert, European Command, Germany.*

BRIG. GEN. THOMAS K. VINCENT, *artillerist, engineer, author, Redstone Arsenal, Huntsville, Ala.*

The Armor of Organization. By Alvin Brown. New York: Hibbert Printing Company. 597 pages. $5.50.

IN the March-April issue of this magazine it was said that there is an urgent need for a literature on modern military organization. This is no longer the case, for this book provides one of the most exhaustive analyses of the subject that has ever been written and offers a plan for reorganization of our defense establishment that is almost revolutionary.

It is the product, not of a trained military officer but of a business executive. Mr. Brown, vice-president of Johns-Manville Corporation, is already author of two works on organizational principles as they apply to modern American industry.

Today, when complex military organizations have become such important parts of our industrial society, this philosopher of modern industry who has proved his philosophy in practice, should qualify to make the objective judgments and sweeping recommendations that he has.

His analysis of the existing organization is chiefly an indictment of the general-staff system. Such a system, he claims, endeavors to delegate authority without delegating responsibility and thereby neither assists nor divides command, but dilutes it. Specifically, Mr. Brown prefers that there be no such office as chief of staff in any military unit, that general staff work be for planning only, and that such assignment be permanent.

The recommended reorganization is based on the principle that aggregate responsibility should be apportioned in mutually exclusive delegations. The author's thesis is that delegation of responsibility is the basic process of organization and that distribution of functions is the method to use.

Combat is deëmphasized from the position of major purpose it now holds to one of the coequal functions. Mr. Brown thereby succinctly expresses what many people both in and out of the services feel today.

One would wish that Mr. Brown had not tried to combine the almost mutually exclusive rôles of philosopher and missionary. His continual faultfinding will annoy many military readers

The RED SEAL K-6330 is Tailored to This Job

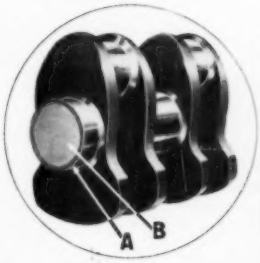
CONTINENTAL MOTORS · Powerful as the Nation · AMERICA'S STANDARD

FIFTY YEARS' AGGRESSIVE ENGINEERING REACH THEIR FINE CLIMAX IN THIS UP-TO-THE-MINUTE POWER PLANT. A FEW OF THE QUALITY FEATURES OF THE RED SEAL K-6330 ARE ILLUSTRATED BELOW.

Exclusive Continental Individual Porting—covered by numerous patents—is a basic reason for the easy starting, smooth running, high power and high economy characteristics for which Red Seals are famous. A complete manifolding system, with in-built provision for uniform distribution of fuel mixture to all cylinders, as well as complete utilization of "heavy ends."

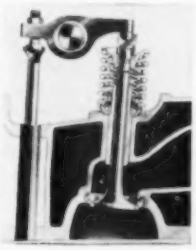
Experience in city after city continues to pile up proof that there's no finer power plant for buses of medium capacity than this Continental K-6330 heavy-duty valve-in-head six. That is because, like every other Continental Red Seal model, the K-6330 is tailored to the specialized needs of one job. It is built to run and keep on running with an absolute minimum of down time, under the severe conditions imposed by bus line use. Save by standardizing on makes with Red Seal power.

Seven main bearings, for utmost rigidity, with sintered tri-metal caps combining strength, precision, and low friction coefficient. Bearings of the K-6330 are line bored and finish reamed with caps in place, to assure a perfect fit.



(Right) Positive Rotation Exhaust Valves, sodium-filled and stellite-faced. Scuffing action provided by their rotation prevents burning of valve lips and seats and retards formation of carbon deposits.

(Left) Tocco-hardened crankshaft journals. Note (A) glass-hard shell produced by induction hardening, and (B) extremely tough inner core.



FACTORY-AUTHORIZED SERVICE AND GENUINE CONTINENTAL RED SEAL PARTS AVAILABLE FROM COAST TO COAST

Continental Motors Corporation
MUSKEGON, MICHIGAN

CANNON PLUGS *get good reception*

The high quality audio connectors shown above are available from all Cannon Franchised Distributors. In their great variety of sizes, shapes and contact arrangements there is no problem or technical requirement in the radio, sound, TV or related fields that cannot be met. Cannon plugs are standard on leading makes of audio equipment and microphones.

CANNON ELECTRIC

Since 1915

FACTORIES IN LOS ANGELES, TORONTO, NEW HAVEN
Representatives in principal cities. Address inquiries to Cannon Electric Co., Dept. EE-133, Los Angeles 31, California.

while others might be less skeptical had he put into this treatise the same objectivity, clear expression, and excellent diagrams that characterize his earlier book, "Organization for Industry."

He leaves the greatest problem of all untouched—how, under the pressure of present events and the shadows of our times, can the transformation be made from the present military structure to the one that he recommends? His great contribution to the future safety and welfare of our country will not be complete until he has done this.

However, every student of military organization and all who are concerned about this problem will be grateful for this book. No general or flag officer of any service should consider himself so busy that he cannot find time to read it. Most important of all, it should be placed in every military library where those responsible for the continuing safety and welfare of our country can always find it. —CAPT. JOHN D. HAYES, U.S.N., *Chief, Procurement Branch, Industrial College of the Armed Forces, Washington, D. C.*

The Atom Story. By Dr. J. C. Feinberg. New York: Philosophical Library. 243 pp. $4.75.

THE author is a noted British scientist who does not tell just another story of the atom bomb. It is the story of the beginnings of the atomic theory in 500 B.C. and traces its development from Anaxagoras to Einstein and thence to present-day atomic fission. Dr. Feinberg forecasts the future for the scientist in this field as well as that of the atom and its connection with the human race in peace and war.

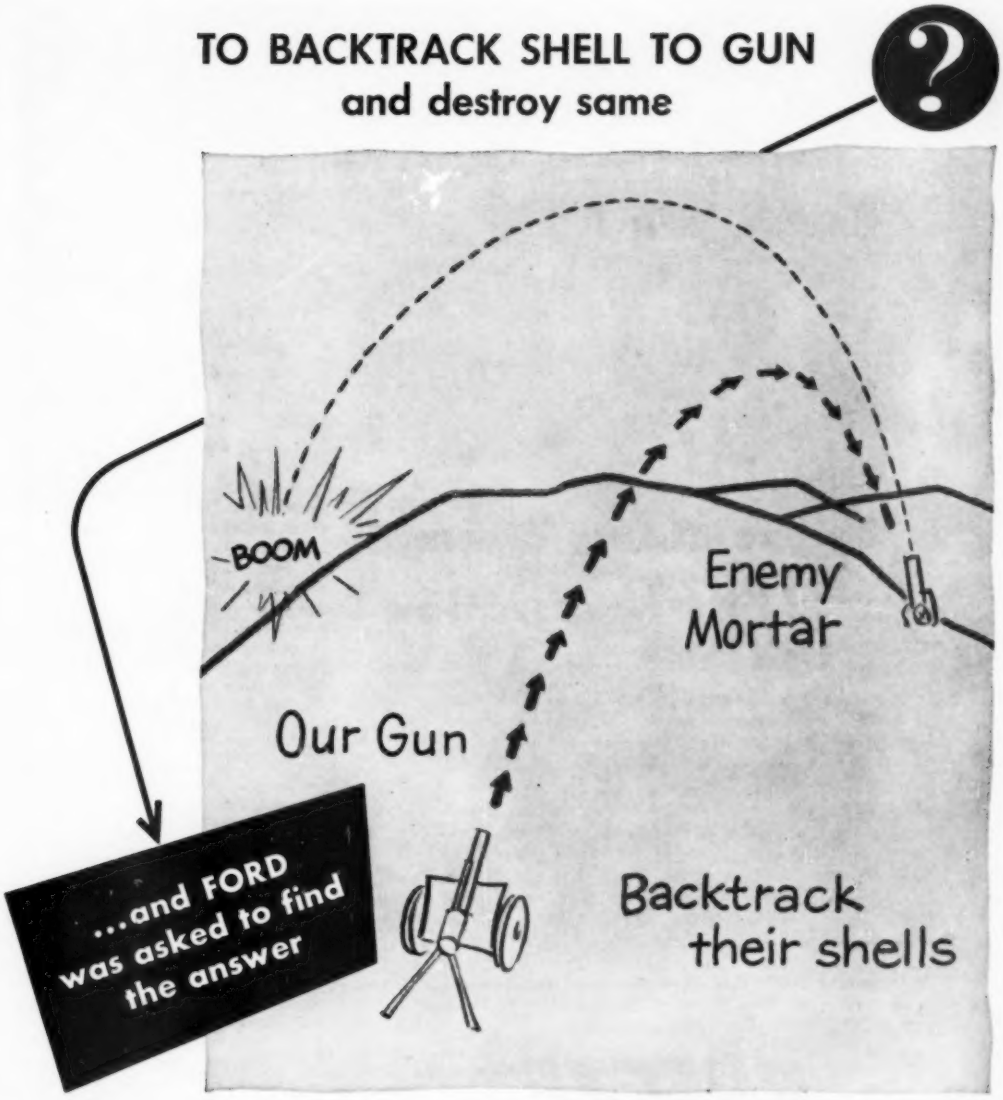
Appended to the book is the U. S. Government publication "Survival under Atomic Attack." The book is written clearly in nontechnical language and is fascinating reading and very informative. —T. K. VINCENT.

The Operational Code of the Politburo. By Nathan Leites. New York: McGraw-Hill Book Company. 90 pp. $3.

THE Rand Corporation, a nonprofit organization chartered to aid the "public welfare and security of the United States of America" is conducting a continuing investigation of Soviet strategy for the United States Air Force. Much of this research is being made available to the public in the belief that it represents a major contribution to our understanding of the Soviet threat. "The Operational Code of the Politburo" is a product of Rand research.

This book was especially written to throw light on the obscurities in Soviet

TO BACKTRACK SHELL TO GUN
and destroy same



Can projectiles be "seen" approaching and their flight backtracked to locate the mortar or gun that fires them? This problem was simply reconciled with special computing equipment designed to be built right into the gun. The engineering of such a computer, the handling of such ballistic data, all falls into the pattern of previous Ford achievements.

This is typical of the problems that Ford has solved since 1915. For from the vast engineering and production facilities of the Ford Instrument Company, come the mechanical, hydraulic electro-mechanical, magnetic and electronic instruments that bring us our "tomorrow" today. Control problems of both Industry and the Military are Ford specialties.

You can see why a job with Ford Instrument Company offers a challenge to young engineers. If you qualify, there may be a spot for you in automatic control development at Ford. Write for brochure about products or job opportunities. State your preference.

6

FORD INSTRUMENT COMPANY
DIVISION OF THE SPERRY CORPORATION
31-10 Thomson Avenue, Long Island City 1, N. Y.

Meet the Hose Clamp Champ that LICKED Vibration

Aero-Seal's famous worm-drive principle set a new standard of hose clamp design—spread from aviation to automotive and wide industrial use. Vibration can't loosen Aero-Seal. And because clamping pressure is uniform all around there is no collapsing or distorting of hose or tube. Uses are legion in aircraft, automotive, marine and industrial products – wherever vibration is a problem and a tight connection the solution. But be sure to get the best – the *original* Breeze Aero-Seal Hose Clamp. Available in ALL STAINLESS STEEL or with STAINLESS BANDS with other components cadmium plated. Manufactured to conform to current ANA specifications.

WRITE TODAY for an Aero-Seal sample, outlining your intended use. Prove for yourself that Aero-Seal *is* the hose clamp champ!

BREEZE
"Aero-Seal" **HOSE CLAMPS**

Multiple contact connectors to meet government specifications. | Job engineered, welded-diaphragm bellows. | Lightweight actuators for any requirement. | Flexible conduit and ignition assemblies.

BREEZE CORPORATIONS, INC.
41 South Sixth Street — Newark, New Jersey

Book Reviews

behavior. The Politburo of the Soviet Union, the world control center of Communism, has long remained what Winston Churchill so aptly called "a riddle wrapped in a mystery inside an enigma."

Here at last is an objective analysis of the concepts and goals of the Soviet brain center. The material consists largely of a chronological review of Politburo action with quotations from Lenin and Stalin. Like Machiavelli's "The Prince," this book sets forth rules of political conduct. More important, the book lets the Kremlin "speak for itself."—JOHN J. DRISCOLL.

Incentive Management. By James F. Lincoln. Cleveland: Lincoln Electric Company. 288 pp. $1.

IN this book the author propounds a philosophy of human relationships in industry and business which, he suggests, is new. Amongst important by-products of the application of this policy to employees of the Lincoln Electric Company is a rise from a bankrupt concern to an average earning capacity of just about double that of the workers in six major corporations of the United States, while during the past twenty years of the application of incentive management, according to the charts in the appendix, the selling price of Lincoln products has dropped steadily to around sixty per cent of the levels of 1933.

However, we are not to conclude that the prospect of unusually high financial reward has been wholly or even principally responsible for these remarkable results. In fact one rather gathers the impression from Mr. Lincoln that men do their best work when rewarded by the acclaim of their fellows and that financial return best serves its purpose when regarded as a measure of intelligence and capacity.

Some of the reasons why men do not put forth their best effort—and most of us don't—are also analyzed in a chapter entitled "Why Incentive Systems Fail." Amongst these are the wage earner's lack of trust in top management's honesty, ability, and understanding, and his concern lest he be "played for a sucker" while others reap unreasonable returns from the sweat of his brow. But the author has less to say about the haunting fear of unemployment which, in the past at least, has helped saddle industry with output limitation and the ca' canny.

With some of Mr. Lincoln's statements, especially in regard to unemployment, there will not be general agreement, but on the whole "Incentive Management" is a challenging study of an age-old problem. In the light of his own successful record, the author is entitled to lament that "It is very difficult . . . to under-

The BENDIX IGNITION ANALYZER Eliminates Tear-Down Time by Checking the Entire Ignition System from the Outside

Result:

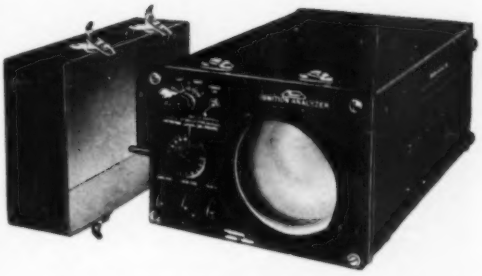
Greatly reduces personnel and equipment needed at Overhaul Depots. When tanks are provided with plug-in facilities for the Bendix Ignition Analyzer, countless man-hours can be saved in repair depots. Entire ignition systems—including spark plugs—can be accurately checked in a matter of minutes. It's not necessary to remove any components to get at the engine and *it's simple enough to be a first echelon operation!*

Result:

Checks leads, magnetos, distributors, coils, too! All phases of the ignition system can be examined by a mechanic who need see only a series of patterns on the screen of the Ignition Analyzer. By comparing these wave forms with known patterns he can either quickly put his O.K. on the ignition system or pin-point the actual trouble. This eliminates "hit and miss" trouble shooting and cuts down general handling.

Result:

Accurately predicts remaining spark plug life! The Bendix Ignition Analyzer also permits mechanics to spot spark plug failure *before* it happens. By reducing voltage to the plug until it stops firing, the mechanic can approximately determine how many hours the plug is going to last. Thus, by preventive maintenance, breakdowns that could put the tank crew in serious trouble can be minimized.



PERFORMANCE PROVEN ADAPTABILITY

The ability of the Bendix Ignition Analyzer to safeguard ignition systems wherever they are in use has been impressively demonstrated by great industrial organizations, the military services, and most leading air-lines the world over.

Under practically every conceivable operating condition, the Bendix Ignition Analyzer has been proven the best means to predict unfailingly the remaining life of individual spark plugs and to check in advance the efficiency of all ignition units.

Bendix

SCINTILLA MAGNETO DIVISION OF SIDNEY, NEW YORK

Bendix AVIATION CORPORATION

The Bendix Analyzer safeguards ignition system in all types of military equipment.

stand why the program outlined herein has not been followed by all industrialists." Why not?—ARTHUR F. MACCONOCHIE.

The United States and Mexico. By Howard F. Cline. Cambridge: Harvard University Press. 452 pp. $6.

THIS is the latest in that rather dreary series of documentaries which is issued as "The American Foreign Policy Library" under the editorship of Sumner Welles and Donald McKay. An immense amount of work goes into each one, together with some competent writing. But it appears that most, if not all, are slanted toward the global viewpoint and the advanced "liberal mind."

The short chapter in which the author approaches his study is quite well done, displaying little bias. This is true of much of the factual discussion which deals with the people, resources, and other of the less controversial features of Mexico.

It is in the field of that perennial feature of Mexican history, the revolution, that the "liberal" view is given rein. The fact that revolutions in Mexico have become so habitual that they coalesce into a way of life is noted. But that they go round and round in an orgy of bloody horror, seems hardly apparent. The worst is past, we hope, but the scars remain.

It is well to remember that it is far easier to throw sand in the eyes of the American people than to remove it! Those A.O.A. members who fought through the heyday of the notorious Nye-Hiss investigation will understand that.—F. W. FOSTER GLEASON.

A Century of Conflict. By Stefan T. Possony. Chicago: Henry Regnery Company. 439 pp. $7.50.

WINSTON CHURCHILL once said that Communism is not only a creed but a plan of campaign. A Communist is not only the holder of certain opinions but the pledged adept of a well-thought-out means of enforcing them.

Why has the Soviet encroachment on the free world thus far succeeded? Has it been due to Soviet ideology or because of Soviet operational know-how?

The author, professor of international politics at Georgetown University, holds the latter view. He points out that the Communists themselves do not preoccupy themselves unduly with their program. Indeed, the Communists gain popular support not through pushing their own platform but by trying to make people believe that Communism stands for the abolition of things that are bad. In this well-documented study, Dr. Possony concentrates attention on the Soviet pattern of conquest, on the development of the Communist doctrine of conflict management, on the Soviet strategy and tactics of world revolution.

The study ranges all the way from Clausewitz to Stalin, from the battle of Cannae to the battle of Stalingrad. Communists have made a thorough study of revolutions and the amount and kind of force necessary to accomplish them. As far as the United States is concerned, social fission would be the strategic weapons system and atomic firepower the tactical master weapon of this system.

But war with the U.S.S.R., Dr. Possony believes, is not inevitable. The objective of our strategy should be to make all-out war an extreme risk for the Soviets and to work toward a gradual modification, contraction, and replacement of Soviet rule.—JOHN J. O'CONNOR.

The Organizational Weapon—A Study in Bolshevik Strategy and Tactics. By Philip Selznick. New York: McGraw-Hill Book Company. 350 pp. $5.

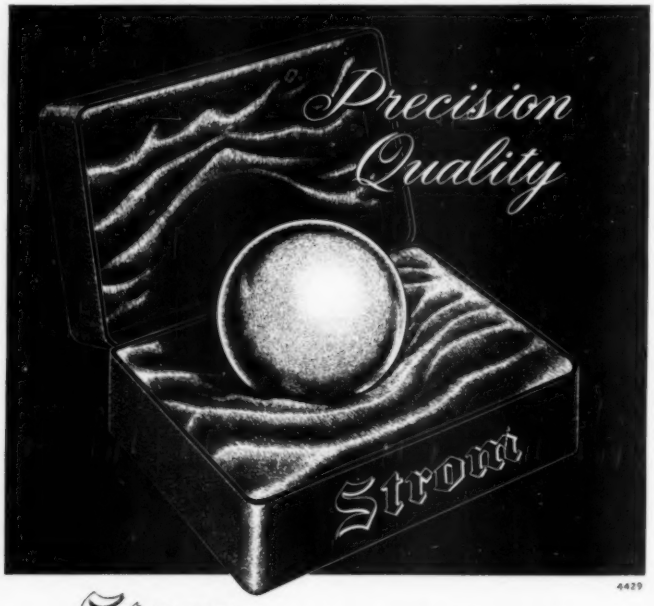
THIS intensive study of the rôle of organization in the struggle for power is especially valuable to industrial and civic organizations in effectively meeting the threat of Communist infiltration and control. The strategy and tactics of Communist penetration of institutions are closely analyzed. Special attention is given to labor unions and similar voluntary associations, and a concluding chapter presents a set of principles for a defense against Communism that will not sacrifice basic civil liberties.—JOHN J. DRISCOLL.

An Outline of Metallurgical Practice. By Carle R. Hayward. Third Edition. New York: D. Van Nostrand Company. 728 pp. $10.

THIS book in its previous editions has already made a place for itself as a standard text on the processing of metal ores from mine to finished product. The author is emeritus professor of metallurgy at M.I.T., and the book is sponsored by the American Smelting & Refining Company, though in no way reflecting any private advertising propaganda.

Although intended primarily as a college textbook, the volume can be used effectively by any one desiring to familiarize himself with the basic production of the common metals from the ores. The text is easily readable, and there is an abundance of drawings and photographic illustrations. There is a remarkable amount of pertinent detail packed into the descriptions.

Many of the sections of the book have been completely rewritten for this edition, and recently developed processes, such as



4429

Strom STEEL BALL CO.
Largest Independent and Exclusive Metal Ball Manufacturer
1850 SO. 54th AVE., CICERO 50, ILLINOIS

H-P-M... FIRST CHOICE OF THE AIRCRAFT INDUSTRY!

Yes, you'll find the biggest names in the aircraft industry on H-P-M's customer list. The confidence these leading builders of planes place in H-P-M is reflected in the fact that the big majority of giant 5000 to 7000 ton presses purchased by the aircraft industry are *all-hydraulic* H-P-Ms.

Pressure processing and H-P-M may also be able to play an important part in your production . . . so, make it a point to talk shop with an H-P-M engineer today!

HPM

THE HYDRAULIC PRESS MFG. CO.

1090 Marion Road, Mount Gilead, Ohio, U. S. A.

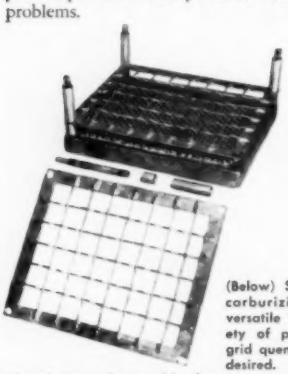
Presses for Every Pressure Processing Application

ROLOCK
FABRICATED ALLOYS

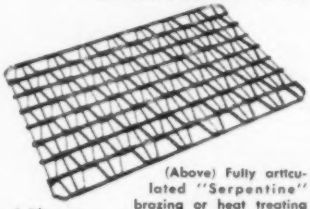
WHY FABRICATED?

All Rolock heat treating equipment is fabricated... not cast. Every carrier is job-engineered for the specific use and made from the correct metals and alloys for maximum resistance to all conditions of exposure, shock and abrasion. Especially successful are Rolock applications of nickel alloys . . . replacing heavy castings with durable, lighter weight fabrications. The examples shown below, while custom-built, can be adapted to your needs. We welcome your requests to solve your heat treating equipment problems.

(Above) Stainless drop-bottom pit furnace basket for quality, uniform heat treat. Saves seconds between heat and quench.

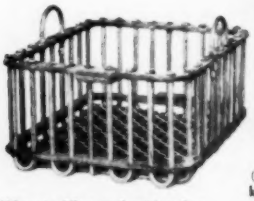


(Above) Rugged assembly for carburizing shafts in pusher furnace. Adjustable posts position fabricated alloy screens; mesh to suit work. Light weight, high pay load, long life.



(Above) Fully articulated "Serpentine" brazing or heat treating tray, retains shape. Heavy or light, any width, length, depth. Many uses at lowest hourly cost.

(Below) Sectional lift post carburizing fixture. Most versatile for handling variety of parts. Each loaded grid quenched separately, if desired.



(Above) Alloy carburizing basket. Loose joints expand under heat. Rugged, flexible construction resists abuse.

(Right) Inconel basket assembly for nitriding. Only required baskets need be used for less than capacity operation . . . reducing furnace load.

Offices in: PHILADELPHIA • CLEVELAND • DETROIT • HOUSTON • CHICAGO • ST. LOUIS • LOS ANGELES • MINNEAPOLIS • PITTSBURGH

ROLOCK INC. • 1356 KINGS HIGHWAY, FAIRFIELD, CONN.

for better work
Easier Operation, Lower Cost

3RL930

Book Reviews

the production of nodulized cast iron and the use of the Geiger counter in uranium concentration, are included.—GEORGE S. BRADY.

Can Russia Survive? An Examination of the Facts and Figures of Soviet Reality. By F. B. Czarnomski. New York: Philosophical Library. 128 pp. $2.75.

THERE can be no reader of ORDNANCE who will not receive the implication of this little volume's title with warm hope that, in the providence of God, the peace of mankind may draw nearer with the breakup of that régime of blood and slavery which has ruled Russia—and now rules so many captive peoples—with gun and whip.

The death of Josef Stalin (the late tyrant's criminal alias) assures the best possible opportunity for an early and severe test of the author's thesis.

Malenkov, the successor to the throne, is not even listed in Mr. Czarnomski's index. With such an overturning of the expectations of ambitious men like Molotov, Beria, Bulganin, and Kaganovich much friction is inevitable. All these wield great power and have tremendous followings. Beria, the much-hated butcher, commands the Secret Police and 500,000 Special Security Troops.

Bulganin commands the political side of the Red Army through his political commissars. Altogether, it shapes up at this moment into a fascinating mess in which revolt of one sort or another is more possible than for many years.

But it is in the examination of the facts of present-day Russia that the book offers the most realistic approach. Documentation is piled upon documentation as to the horror under which the people of the U.S.S.R. exist. There seems little doubt that if there is any possibility of success, and if we take this opportunity to aid with wisdom and firmness, the greatest hope of decades is in prospect. Readers of ORDNANCE will find this little study of much interest and considerable informative value at this time.—F. W. FOSTER GLEASON.

Arctic Solitudes. By Admiral Lord Mountevans. New York: The Philosophical Library. 134 pp. $4.50.

PRIMARILY intended as a history and picture of exploration, "Arctic Solitudes" is a mixture of many interesting experiences and factual accounts of Arctic expeditions, together with miscellaneous side notes on the life of the Eskimo.

Any attempt to condense 900 years of exploration of so vast and forbidding an area as the Arctic into 134 pages is an

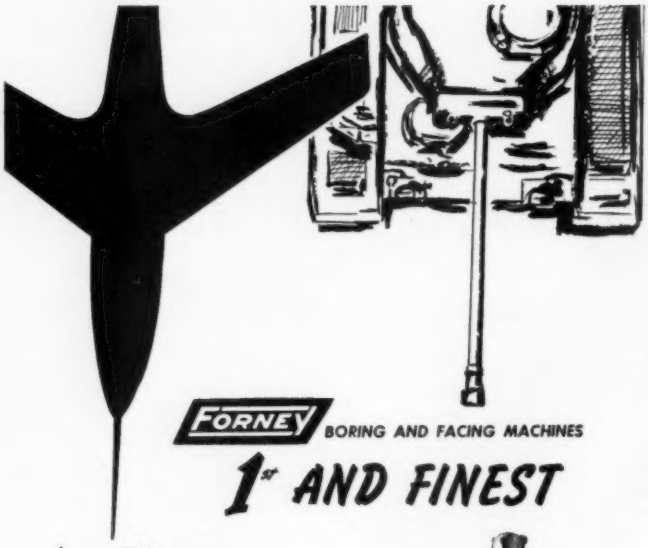
It's welded... but you can't feel the weld

• A special tool removes any exterior weld flash from electric-welded steel tubing immediately after welding . . . thus the *eye-appeal* of products like tubular steel furniture. If required, the inside can be similarly finished, meeting the *functional* requirements of products like pneumatic tube systems.

Investigate the economy and physical advantages of Brainard welded steel tubing for *your* products. Write Brainard Steel Division, Dept.EE-5,Griswold Street, Warren, Ohio. An integrated producer; offices throughout the U. S.

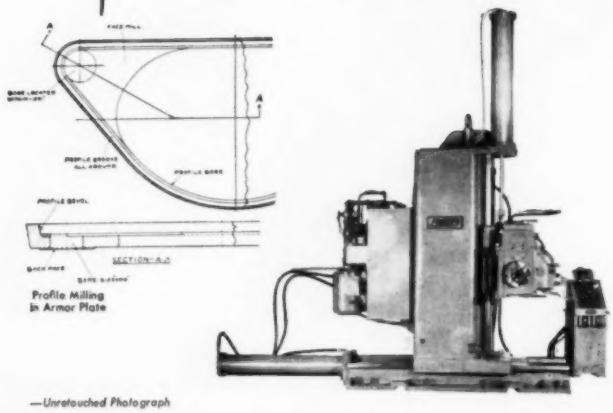
Brainard
SHARONSTEEL
STEEL DIVISION
SHARON STEEL CORPORATION

WELDED STEEL TUBING



FORNEY BORING AND FACING MACHINES

1st AND FINEST



—Unretouched Photograph

Complicated, irregular profile milling and boring jobs are easy and economical when done by a Forney profile boring and facing machine. Forney machines are specially engineered for work on aluminum and magnesium castings and forgings.

Whether you make parts for the highly specialized aircraft industry, armored vehicles or other technical fields you will make them better for less with a Forney.

These custom made, double-duty machines are equipped with duplicator equipment with templates. A spindle housing as a motor power unit moves directly into the work face. This results in more accurate work, more power and rigidity in the cutting tool.

Top quality work holding fixtures tooling and floor plates are also available. Write or phone us today. Forney engineers are ready to serve you immediately upon receipt of your drawings.

FORNEY'S INC.

Manufacturers of Special Machinery Since 1916

211 ELM STREET NEW CASTLE, PENNA.

Book Reviews

extremely difficult task. It is unfortunate that greater care was not taken to integrate the basically sound data with a logical system of presentation. In many chapters the author introduces material that has no apparent relationship to the chapter topic, and often has no connection with the preceding paragraphs. The effectiveness of the numerous good photographs is lessened by poor placement with respect to the pertinent text.

The real value of the book lies not so much in its historical accounts as in its numerous interesting, informative, and dramatic anecdotes.—WADE R. CURRIER, *aërial map surveyor, Washington, D. C.*

Contemporary Foreign Governments. By Herman Beukema and Associates. New York: Rinehart & Company. 610 pp. $5.50.

THIS third edition of Colonel Beukema's standard text on contemporary foreign governments contains much new material of both a factual and an interpretive nature. The government of Italy is not considered but there is a new chapter on government as an institution. A glossary has been added and there are questions and problems at the end of each chapter.—JOHN J. O'CONNOR.

Arms of Our Fighting Men; Wings of Our Air Force; Wings of Our Navy; Jets of the World. By Maj. C. B. Colby. New York: Coward McCann, Inc. 62 pp. each. $1.00 each.

THIS is a series of four 62-page booklets containing collections of photographs and brief 4-line descriptions of combat equipment. Three of the books cover only United States armed forces equipment. The fourth, "Jets of the World," covers jet aircraft of seven foreign countries as well as those of the United States Air Force and United States Navy.

The booklets may be useful in nonmilitary libraries. They may also be useful for visitors in anterooms of offices of companies which have contracts to produce combat equipment for the United States armed forces. The booklet on jet aircraft has a few pictures of Russian aircraft which may be of interest to those participating in the air defense program of the United States.

However the booklets will be of little use for operational, development, or production purposes since better and more detailed information can be found in many official publications.—PHILIP SCHWARTZ.

Monsoon Seas. By Alan Villiers. New York: McGraw-Hill Book Company. 337 pp. $4.75.

A SAILOR from the age of fifteen, a

Bendix

AIR-PAK

changes air pressure into hydraulic pressure for completely dependable braking

Bendix® AIR-PAK is a compact, power-braking unit that changes air pressure into hydraulic pressure by means of two directly connected pistons. A non-compressible column of brake fluid instead of air connects between the driver's foot and the brake. In an emergency situation, if air pressure fails for any reason or if braking is required before air pressure builds up, brakes can be applied instantly by foot power alone.

Designed to combine all of the well-known advantages of hydraulic brake actuation with an air brake system, AIR-PAK offers faster brake action, more positive and better control.

Add to these outstanding performance characteristics the fact that AIR-PAK is a product of Bendix, designer and builder of Hydrovac®, the world's most widely used power brake with OVER THREE MILLION UNITS in use, and you have an unbeatable combination for the utmost in braking efficiency.

For truck manufacturers or operators interested in AIR-PAK, a descriptive folder is available on request.

®REG. U.S. PAT. OFF.

Bendix Products Division

THE MOST TRUSTED NAME IN BRAKING

BENDIX · PRODUCTS DIVISION · SOUTH BEND, INDIANA

Export Sales: Bendix International Division, 72 Fifth Ave., New York 11, N.Y. Canadian Sales: Bendix-Eclipse of Canada, Ltd., Windsor, Ontario, Canada

AVIATION CORPORATION

man who has sailed to every coast and island in the Indian Ocean in everything from an Arab dhow to full-riggers, a student of historical seafaring and the geography of his favorite waters—what better qualifications for the author of this combination of history and personal adventure?

This is a colorful book with appeal—there is not one boring page. The great sweep of history of the Indian Ocean here becomes a popular subject, and, with the addition of Villiers' personal adventures, you have a book that fully grasps the spirit of the great spice seaway and its many tropical islands and ports of call.—ROBERT LA RUE.

Your War for Peace. By Brig. Gen. Frank L. Howley. New York: Henry Holt and Company. 166 pp. $2.75.

GENERAL HOWLEY needs no introduction to readers of ORDNANCE magazine. They have followed his outstanding military career through the European phases of the Second World War and more particularly during his service in Berlin in the years following that conflict. He entered the Army in 1940 as a captain in the cavalry. In 1945 he became the first Military Governor of Berlin.

During the four years of his governorship he founded the Free University, Berlin, which has a current enrollment of over 1,000 students. Now vice-chancellor of New York University, he is the author of four of the best commentaries on the American effort to bring peace against insistent Soviet opposition. His earlier books will be remembered as "Berlin Command," "My Four Years' War with the Reds," "How Big Is Russia's Bluff," and "Characteristics of Russian Leaders."

This present book is based on a recent trip to West Germany and France and is written with the realism and directness for which the author is noted. It is an examination of American foreign policies from appeasement to coexistence to containment. While critical, it is also instructive and proposes a course of action for our country and for every individual in it which, if followed in the mind of this reviewer, would lead us quickly out of the quagmire into which in recent years we have gotten ourselves deeper and deeper. General Howley suggests a sensible way out.—L. A. CODD.

The Ordnance Book Service recommends as its Book of the Month for May:

- **Your War for Peace.** By Brig. Gen. Frank L. Howley. See preceding review. Retail price, $2.75. To A.O.A. members only, $2.47.

The Ordnance Book Service also recommends the following books:

- **The Armor of Organization.** By Alvin Brown. See review on page 978. Retail price, $5.50. To members, $4.95.
- **Broadax and Bayonet.** By Francis Paul Prucha. The rôle of the U.S. Army in the development of the Northwest. Retail, $4.00. To members, $3.60.
- **Back Down the Ridge.** By W. L. White. A saga of the Army Medical Corps. Retail, $3.00. To members, $2.70.
- **The History of the French First Army.** By Marshal de Lattre de Tassigny. Translated by Malcolm Barnes with a foreword by General Eisenhower and an appreciation by Capt. B. H. Liddell Hart. Retail, $9.50. To members, $8.55.
- **Mission with Mountbatten.** By Alan Campbell-Johnson. Retail, $5.00. To members, $4.50.
- **The Ultimate Weapon.** By Oleg Anisomov. General Donovan, late of the Office of Strategic Services, has called this book "the first real approach to political warfare." Retail, $3.50. To members, $3.15.

Order these books from the Ordnance Book Service, 705 Mills Building, Washington 6, D. C. Check must accompany order.

Mechanized Impregnation

. . . of porous metals

gives complete and permanent protection against leaks, corrosion, and other failures, by assuring 100% filling of all pores, with exclusive METASEAL equipment and methods.

saves:

. . . dollars!

. . . time!

. . . space!

. . . labor!

The self-contained Hub Unit includes two autoclaves, high vacuum pump, thermostatically controlled wash tanks, mechanical surging unit, a power operated hoist. Yet the entire unit occupies less than 40 sq. ft. of floor space, and *one man operates all controls.*

For treating large castings or big batches, METASEAL engineers custom-design impregnating systems with space-saving, money-saving, and time-saving equipment to meet individual needs and space limitations. Used with the METASEAL polyester impregnant, solventless cleaning, and the positive vacuum-pressure cycle, this equipment assures complete impregnation of ferrous and non-ferrous castings every time.

METASEAL process, equipment and materials meet all armed services specifications.

Metaseal

AMERICAN METASEAL MFG. CORP. • 30 EAST 60TH STREET • NEW YORK 22, N.Y. • PL 3-7010

A METASEALED CASTING IS A BETTER CASTING

the extra BRAKING STAMINA proven here...

means greater DEPENDABILITY for Ordnance vehicles

Dam Construction on the Columbia River.

Rugged Bendix-Westinghouse Air Brakes Keep Giant Earthmovers on the Job Day After Day!

Why not take a braking tip from the men who operate the rugged off-the-road giants? They'll tell you it takes **stopping power, durability and performance-plus** to provide perfect braking control for nearly 50 tons of solid rock and steel, defying gravity up grade and down under the very toughest of operating conditions. Ask them what brakes they choose for this tremendous task and time after time you'll get the same answer—Bendix-Westinghouse. That's because these mighty brakes, built by the industry's most experienced manufacturer, pay off with the **safest, surest, most dependable braking action** and longest service life in the business. And these are factors that make these mighty brakes your logical choice for any ordnance vehicle. That's why, when you specify brakes, you can **be sure of the utmost in safety, dependability and stamina** by specifying Bendix-Westinghouse — the world's most tried and trusted air brakes! Performance proven for peak reliability on ordnance vehicles in World War II.

Bendix-Westinghouse

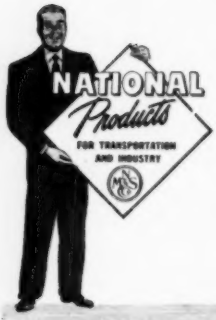
THE WORLD'S MOST TRIED AND TRUSTED

AIR BRAKES

BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY • ELYRIA, OHIO • BERKELEY, CALIF.

Castings by National

selected for Quality and Dependability



Products bearing these familiar trademarks have all established enviable reputations for quality and dependability.

These manufacturers *continue* to procure castings by National—one of the Nation's largest founders.

NORTHWEST · EATON · M W · A-C ALLIS CHALMERS · Buda · CATERPILLAR · American-Standard PRODUCTS · TIMKEN Detroit AXLES · BALDWIN BLH LIMA-HAMILTON

National's unparalleled experience in producing malleable, heat-treated malleable, and steel castings is at your disposal. Sales offices and engineering facilities are located at all five strategically located plants. A-8365

PLANTS LOCATED IN Sharon, Pa., Cleveland 6, Ohio, Indianapolis 6, Ind., Melrose Park, Ill., and Chicago 50, Ill.

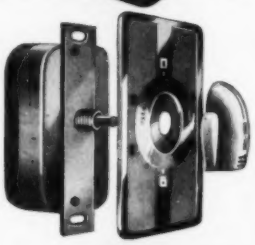
SEE "This Moving World"

A 16mm technicolor film. Narrated by Edwin C. Hill, this 27-minute film tells how malleable iron is made . . . tested . . . used . . . how its production economy, ductility, machinability, toughness will give you a better finished product. Available for group showings.

NATIONAL Products FOR TRANSPORTATION AND INDUSTRY

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY
CLEVELAND 6, OHIO
Est. 1868

MARK-TIME "9000" Wall Time Switch



turns current off or on WHEN YOU'RE NOT THERE!

This Mark-Time switch is a good deal more than a great convenience . . . it saves you money! Because it remembers to turn the current off or on when you're not there to do it!

"9000" automatically controls circuits of store window lights, neon signs, hall and garage lights, attic fans, farm lighting systems . . . dependably turning them on or off at the time you set.

"9000" is easily mounted in any standard rectangular wall box. Movements only available for home or industrial heating controls.

Write today for full details and prices.

SPECIFICATIONS

Time ranges from 3 minutes to 12 hours. Rated at 20 amperes, 125 volt, 1 HP or 10 amperes, 250 volt operation, AC only. Available for either ON or OFF type operation. Hold feature also available—at HOLD position, current is ON, but timing mechanism does not operate until knob is turned from HOLD to a time period.

MARK-TIME

M. H. RHODES, INC.
HARTFORD, CONNECTICUT

Manufactured and sold in Canada by SPERRY GYROSCOPE OTTAWA, Limited 3 Hamilton St., Ottawa, Ontario, Canada

Hunting—another great American heritage

"To arms! To arms! The British are coming!"... It was a sharp, echoing cry of warning that rang through the sleeping Massachusetts countryside as Paul Revere kindled the patriots to defiance and defense. Daring Revolutionary hero, accomplished silversmith and famous dentist—Paul Revere was also a red-blooded hunting enthusiast.

Escaping from the duties and cares of business, Revere often trekked through New England woods and fields to stalk game: "Then sometimes take my dog and gun," as one of his poems phrased it. He knew every emotion of the hunter. The thrill of tracking quarry, sighting it, making the kill, and the rugged outdoor life . . . all were enjoyed by Paul Revere, hunter.

For exciting action and keen satisfaction, no other sport can match hunting. It has long built character, self-reliance and endurance . . . offered many hours of thrills and enjoyment to millions of marksmen.

You can help promote the popular sport of hunting by cooperating in local and national conservation programs. Remember—conservation today means good shooting tomorrow! E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

N.R.A. RANGER

WRITE FOR FREE BOOKLET on how to start a rifle club . . . win Ranger Shooting Emblems. Sportsmen's Service Bureau, Department D-2, Sporting Arms and Ammunition Institute, 250 E. 43rd Street, New York 17, N. Y.

DU PONT
REG. U. S. PAT. OFF.

DU PONT SPORTING POWDERS

WORLD-FAMOUS SINCE 1802

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Rockwell Report

by W. F. ROCKWELL, JR.
President
Rockwell Manufacturing Company

ONCE A YEAR we bring our plant managers, division sales managers and headquarters staff together to review the year just closed, discuss budgets for the new year, and to clarify management plans. Naturally, one of the questions that gets quite a going over is "How is business going to be this year?"

We had our 1953 meeting a few weeks ago, and after listening to outside consultants and our own market research department sum up the various factors that affect business generally, our product sales managers had their say.

To an outsider, it might have seemed that they were talking about different things, or at least a different year. Some of them said, positively, that 1953 was going to be better than 1952. Some said just as definitely that 1953 looked threatening.

Of course, their viewpoints were entirely controlled by the market for their particular products, and while their differences of opinion make over-all forecasting more difficult, we were glad to see them. For one thing those differences in business outlook mean that our diversification is working.

One of the principles on which this business is run is that our products and our markets should not follow identical business cycles, so that sales peaks and valleys do not coincide, thus providing a more stable operation. When our sales management disagrees among itself on the outlook, that is diversification at work.

* * *

Newest development in our Nordstrom valve line is valve lubricants packaged in tubes. In tubes, the lubricant is always fresh and clean, easy to handle, and a space and time saver for maintenance departments and supply stores. Since one tube fits all sizes of Nordstrom valves, the inventory problem is simplified. There are two types—one for gun lubrication and one manual lubrication.

* * *

The one hundredth anniversary of the founding of any company is a noteworthy event. But when a cab company can celebrate a century of transportation service, the occasion is even more marked.

Toye Bros. Yellow Cab Company of New Orleans started operations in 1852 with one horse-drawn carriage. Today, the fourth generation of the founder carries on with a huge fleet of modern streamlined cabs.

Toye Bros. is one of the oldest and largest customers for Ohmer taximeters, made by our Register Division. This firm has used Ohmer taximeters exclusively for over 30 years.

* * *

More Case Histories of Cost Cutting With Rockwell-Built Delta Tools: Three men and a Delta radial saw cut a complete pre-engineered house a day in the shop of Horstman, Inc., Erie, Pa. builder . . . Allen Chambers, Kansas City general contractor, reports that by installing Delta radial saws at the construction job site, he does what used to cost $1500 in labor for $350 . . . Copeland Refrigeration Corp., Sidney, O., uses over 200 Delta drill presses. On one job, a $300 investment in Delta drill presses saved $24,000 in the first year over the former method, with an output of 200 pieces per day instead of 35, and needs three operators instead of seven . . . Binghamton Die and Machine Co., Binghamton, N. Y., puts a Delta drill press on every diemaker's work bench, rather than to move men or machines around the shop. "It's much cheaper," says Frank Bowie, president.

One of a series of informal reports on the operations and growth of the
ROCKWELL MANUFACTURING COMPANY
PITTSBURGH 8, PA.
for its customers, suppliers, employees, stockholders, and other friends

metalwash designs and manufactures washing, pickling, drying, and phosphating machinery for the widest range of applications.

prior to MACHINING

prior to PLATING

after HEAT TREATING

prior to ENAMELING

prior to PAINTING

Write for free illustrated catalog

METALWASH
MACHINERY CORPORATION

922 North Ave., Elizabeth 4, N. J.
Representatives in principal cities

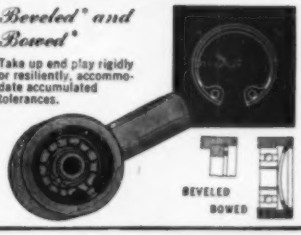
Speed Production, save material and machining operations with Waldes Truarc Retaining Rings

better way to hold parts together

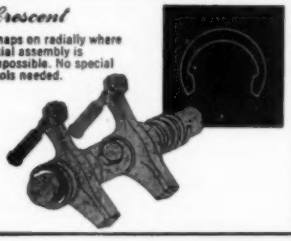
THERE'S A TRUARC RING FOR EVERY PURPOSE

Standard* — Forms secure shoulder for tight pressure fit when installed in groove.

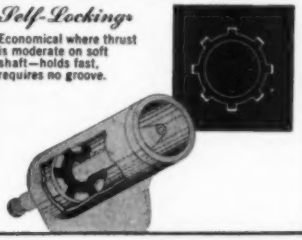
Beveled* and Bowed* — Take up end play rigidly or resiliently, accommodate accumulated tolerances.



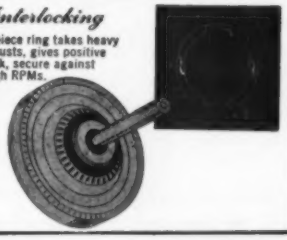
Crescent — Snaps on radially where axial assembly is impossible. No special tools needed.



Self-Locking* — Economical where thrust is moderate on soft shaft—holds fast, requires no groove.



Interlocking — 2-piece ring takes heavy thrusts, gives positive lock, secure against high RPMs.



Inverted* — Provides uniform shoulder for curved abutting surfaces, for bearings with large corner radii.

Triangular Self-Locking — Low cost ring for soft shafting materials, requires no groove, secure against vibration.

E-Ring — Provides large strong shoulder for small shaft. Applied radially.

*BOTH INTERNAL AND EXTERNAL TYPES AVAILABLE

Thousands of smart manufacturers are *stepping up* production, while actually *cutting* costs—with Waldes Truarc Retaining Rings! Truarc Rings simplify your designs. The ease with which they can be assembled and disassembled makes them superior in many fastening applications where machined shoulders, nuts, bolts, snap rings or cotter pins have been used.

Waldes Truarc Rings eliminate threading, milling and other skilled labor operations... save on material. And there's a Truarc Ring for every purpose... precision-engineered to conform to the highest NAS and SAE standards!

Waldes Truarc Rings are nationally distributed and stocked. Send us your drawings. Waldes Truarc engineers will give your problem individual attention, without obligation.

WALDES TRUARC

REG. U. S. PAT. OFF.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

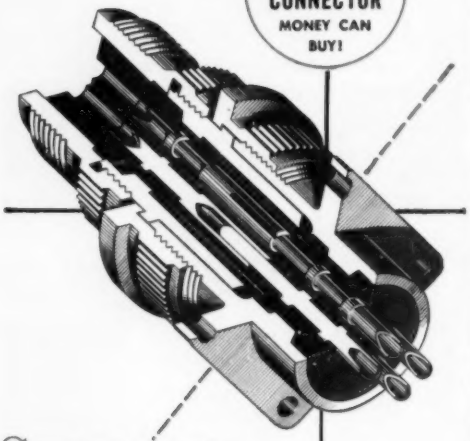
WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U.S. PATENTS: 2,382,947; 2,382,948; 2,416,052; 2,420,921; 2,420,341; 2,439,705; 2,441,646; 2,455,165; 2,483,289; 2,483,383; 2,487,902; 2,487,903; 2,491,306; 2,509,081 AND OTHER PATENTS PENDING.

SUB-CONTRACTING FACILITIES AVAILABLE

The same precision production facilities which have turned out millions of Truarc Rings to the most exacting specifications are available to handle sub-contracting of metal stampings. Write directly to Waldes Kohinoor, Inc., 47-16 Austel Pl., Long Island City 1, N.Y.

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, N. Y. • MAKERS OF FAMOUS, PRECISION-ENGINEERED WALDES SLIDE FASTENERS AND SNAP FASTENERS

The Finest
ELECTRICAL CONNECTOR MONEY CAN BUY!



SCINFLEX **ASSURES LOW MAINTENANCE BECAUSE IT PERMITS SIMPLICITY**

When operating conditions demand an electrical connector that will stand up under the most rugged requirements, always choose Bendix Scinflex Electrical Connectors. The insert material, an exclusive Bendix development, is one of our contributions to the electrical connector industry. The dielectric strength remains well above requirements within the temperature range of −67°F to +275°F. It makes possible a design increasing resistance to flashover and creepage. It withstands maximum conditions of current and voltage without breakdown. But that is only part of the story. It's also the reason why they are vibration-proof and moisture-proof. So, naturally, it pays to specify Bendix Scinflex Connectors and get this extra protection. Our sales department will be glad to furnish complete information on request.

• Moisture-Proof • Radio Quiet • Single Piece Inserts • Vibration-Proof • Light Weight • High Insulation Resistance • High Resistance to Fuels and Oils • Fungus Resistant • Easy Assembly and Disassembly • Fewer Parts than any other Connector • No additional solder required.

BENDIX SCINFLEX
ELECTRICAL CONNECTORS

Bendix

SCINTILLA MAGNETO DIVISION of SIDNEY, NEW YORK

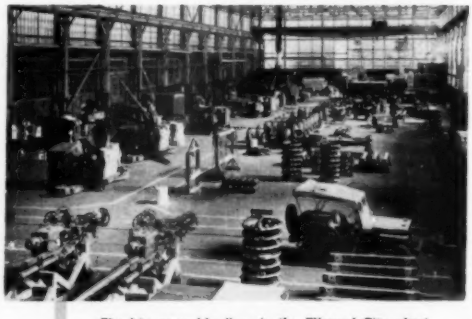
Bendix AVIATION CORPORATION

Export Sales: Bendix International Division, 72 Fifth Avenue, New York 11, N. Y.

FACTORY BRANCH OFFICES: 118 E. Providencia Ave., Burbank, Calif. • Stephenson Bldg., 6560 Cass Ave., Detroit 2, Michigan • Brouwer Bldg., 176 W. Wisconsin Avenue, Milwaukee, Wisconsin • 582 Market Street, San Francisco 4, California

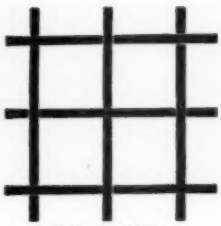
Specialists in ORDNANCE WORK

U. S. Ordnance and **Aetna-Standard** have worked hand in hand for the last decade on several important contracts. Recently, we completed a large production run on a jeep mount for a 105 MM recoilless rifle. We are busy on two other long-range contracts . . . one for an anti-aircraft gun and the other for an anti-tank gun. In addition to the production, Aetna-Standard assisted in the design and pilot models on both of these items. Below you see the big Ordnance assembly floor in Aetna's Ellwood City, Pa., plant.

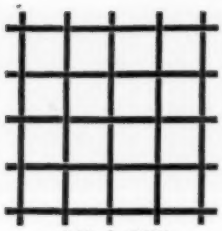


The big assembly floor in the Ellwood City plant is the center of activity for Ordnance work.

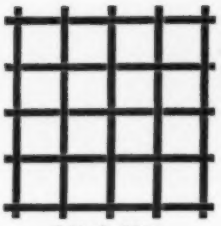
The Aetna-Standard Engineering Company
FRICK BUILDING
PITTSBURGH, PENNA.



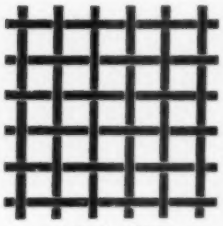
2 Mesh .063"
76.4% Open Area



3 Mesh .041"
76.7% Open Area

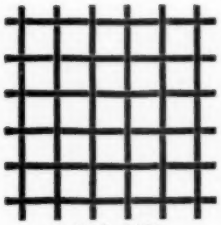


3 Mesh .054"
70.1% Open Area

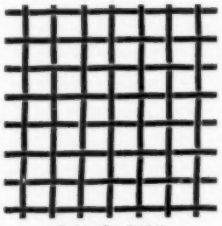


4 Mesh .063"
56.0% Open Area

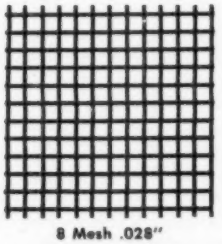
CALL CHASE



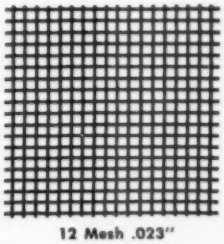
4 Mesh .047"
65.9% Open Area



5 Mesh .041"
63.2% Open Area

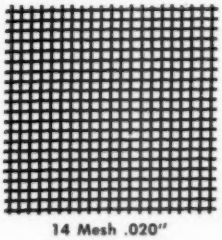


8 Mesh .028"
60.2% Open Area

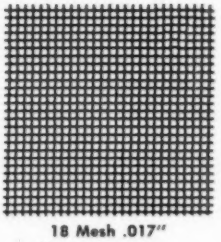


12 Mesh .023"
51.8% Open Area

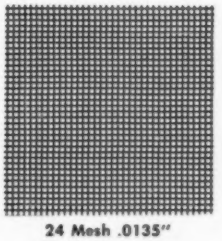
FOR INDUSTRIAL WIRE CLOTH



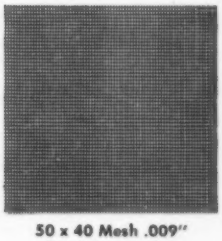
14 Mesh .020"
51.0% Open Area



18 Mesh .017"
48.3% Open Area



24 Mesh .0135"
45.8% Open Area



50 x 40 Mesh .009"
35.7% Open Area

IN BRASS AND COPPER

From coarse wire cloth for window or door grilles . . . right down to extra-fine mesh for food preparation, call Chase.

Double crimped wires of Chase Wire Cloth keep openings square and true . . . mesh uniform. It is woven in a mill which specializes in weaving brass, copper and copper-alloy wire cloth. The result is *quality*.

For information on the size and type wire cloth you need, send for free book or call your nearest Chase warehouse.

Chase®

BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

Albany†	Chicago	Denver†	Kansas City, Mo.	Newark	Pittsburgh	San Francisco
Atlanta	Cincinnati	Detroit	Los Angeles	New Orleans	Providence	Seattle
Baltimore	Cleveland	Houston	Milwaukee	New York	Rochester†	Waterbury
Boston	Dallas	Indianapolis	Minneapolis	Philadelphia	St. Louis	(†sales office only)

LOOK TO LACQUER for the

Military (MIL) Specifications

MIL-S-974 (AER)	Surfacer; Sanding
MIL-A-3167(1)	Adhesives, for Plastic Inhibitors (Supersedes ND-OS-1658)
MIL-C-5541(1)	Chemical Films for Aluminum and Al. Alloys (Supersedes AN-C-170)
MIL-D-5552	Dope; Cellulose Nitrate, Clear, for Aluminum Dope (Supersedes AN-TT-D-551)
MIL-D-5553	Dope; Cellulose Nitrate, Clear (Supersedes AN-TT-D-514)
MIL-D-5554	Dope; Cellulose Nitrate, Pigmented (Supersedes AN-TT-D-554)
MIL-D-5555(1)	Dope; Cellulose Nitrate, Pigmented, Camouflage
MIL-L-6047(1)	Lacquer; Aromatic Fuel-Resistant (Supersedes BuAer M-769)
MIL-T-6094A	Thinner; Cellulose Nitrate Dope and Lacquer
MIL-T-6095A	Thinner; Cellulose Nitrate Dope and Lacquer, Blush-Retarding (Supersedes AN-T-258)
MIL-C-6796	Coatings, Protective (for wood)
MIL-C-6798	Coatings, Rust-Inhibiting (for metal containers)
MIL-L-6805A(1)	Lacquer; Camouflage
MIL-L-6806	Lacquer; Clear, Aluminum-Clad Al. Alloy Surfaces (Supersedes AN-L-37)
MIL-P-6889A	Primer; Zinc-Chromate, for Aircraft Use (Amend. 1)
MIL-L-7178(1)	Lacquer; Cellulose Nitrate, Gloss for Aircraft Use (Supersedes AN-L-29a and 52L26 (Aer))
MIL-S-10103A	Surfacer, Lacquer (Lacquer-Resistant) for Steel Articles
MIL-S-10181 (ORD)	Surfacer; Sanding, Lacquer-Type
MIL-L-10182 (ORD)	Lacquer; Cellulose Nitrate, Automotive
MIL-L-10287 (ORD) (1)	Lacquer, Cellulose Nitrate and Thinner (Supersedes No. 3-158A)
MIL-C-10506 (QMC)	Coating, Exterior, for Food Cans (Used in lieu of JAN-C-237 and JAN-C-238)
MIL-C-10979 (CmlC)	Coatings, Exterior, Air-Drying, with Primer (for one-ton containers and steel drums)
MIL-S-11123 (QMC)	Sealer, Sanding, Lacquer-Type, for Wood Furniture
MIL-L-11195A	Lacquer, Lustreless, Hot-Spray
MIL-A-11238 (ORD)	Adhesive, Cellulose Nitrate (for Ordnance use)
MIL-F-11375 (QMC)	Filler, Wood
MIL-L-11376 (QMC) (1)	Lacquer, Rubbing, Clear (for Wood Furniture)
MIL-P-11414A	Primer, Lacquer, Rust-Inhibiting
MIL-L-12277 (ORD)	Lacquer, Automotive, Hot-Spray
MIL-L-16504 (Bu. Ord.)	Lacquer, Sealing (for Ammunition) (Supersedes 52-L-23 (Ord))

U. S. Army Specifications

ORDNANCE CORPS

3-158	Lacquer, Nitrocellulose, Clear & Pigmented
3-163	Lacquer, for Landing-Light Reflectors (Supersedes No. 14075)
3-184	Lacquer, Rust-Inhibiting, Clear
3-198	Lacquer, Ethyl Cellulose, Special (for Ordnance Material)
3-199	Lacquer, Lustreless Sand, Obliterating
50-11-90A	Cement, Nitrocellulose, for use in Ammunition
62-6	Adhesive for Cellulose Nitrate Film on Metals
AXS-816 (ORD)	Lacquer, Olive Drab, Lustreless (for plastic compositions)
AXS-1258 (ORD)	Lacquer Primer, Rust-Inhibiting (for ammunition)
AXS-1472	Adhesive, Label, Water-Resistant
FXS-284	Lacquer; Opaque or Transparent (Identification of Small Arms Ammunition)
RIXS-113	Lacquer for Leather and Webbing (Rock Island Arsenal)
D6550295	Painting Procedure (Detroit Arsenal)

CHEMICAL CORPS

196-131-59A	Lacquer, Air-Drying and Thinner (High Hiding Power)
197-54-144B	Lacquer, Air-Drying and Thinner (for Crimped Parts)

Finest in Finishes . . . You can meet hundreds of military and civilian needs effectively and economically with these *SPECIFICATION* finishes or modifications of them, including those for . . .

U. S. Air Force Specifications

T-25C	Thinner, Nitrocellulose Dope and Lacquer
14105-C (AER)	Lacquer, Cellulose Nitrate Camouflage (Superseded by AN-L-21 or MIL-L-6805A)
14115	Surfacer; Wood, Liquid
14137 (AER)	Cement, Cellulose Nitrate Base

U. S. Navy Specifications

OS-848	Paint, NRC Compound
OS-1210	Paint & Lacquer used on Bombs and Projectiles purchased by Navy
52-L-21 (ORD)	Lacquer, Cable, Fungus-Resistant
52-L-23 (ORD)	Lacquer, Sealing (for ammunition) (Superseded by MIL-L-16504 (Bu. Ord.))
U-L-51	Lacquer, Model

Joint Army-Navy (JAN) Specifications

JAN-L-79	Lacquer Enamel, Lustreless
JAN-C-99(1)	Cement, pettman
JAN-C-173	Coating Materials, Moisture- and Fungus-Resistant for the Treatment of Communication Equipment
JAN-C-237	Coatings; Exterior, Air-Drying, Camouflage & Rust-Inhibiting (for Food Cans)
JAN-L-296(1)	Lacquer, Purple
JAN-C-388	Compound, Sealing, N.R.C.
JAN-L-1118(1)	Lacquer, Clear Brushing; and Thinner

Federal Specifications

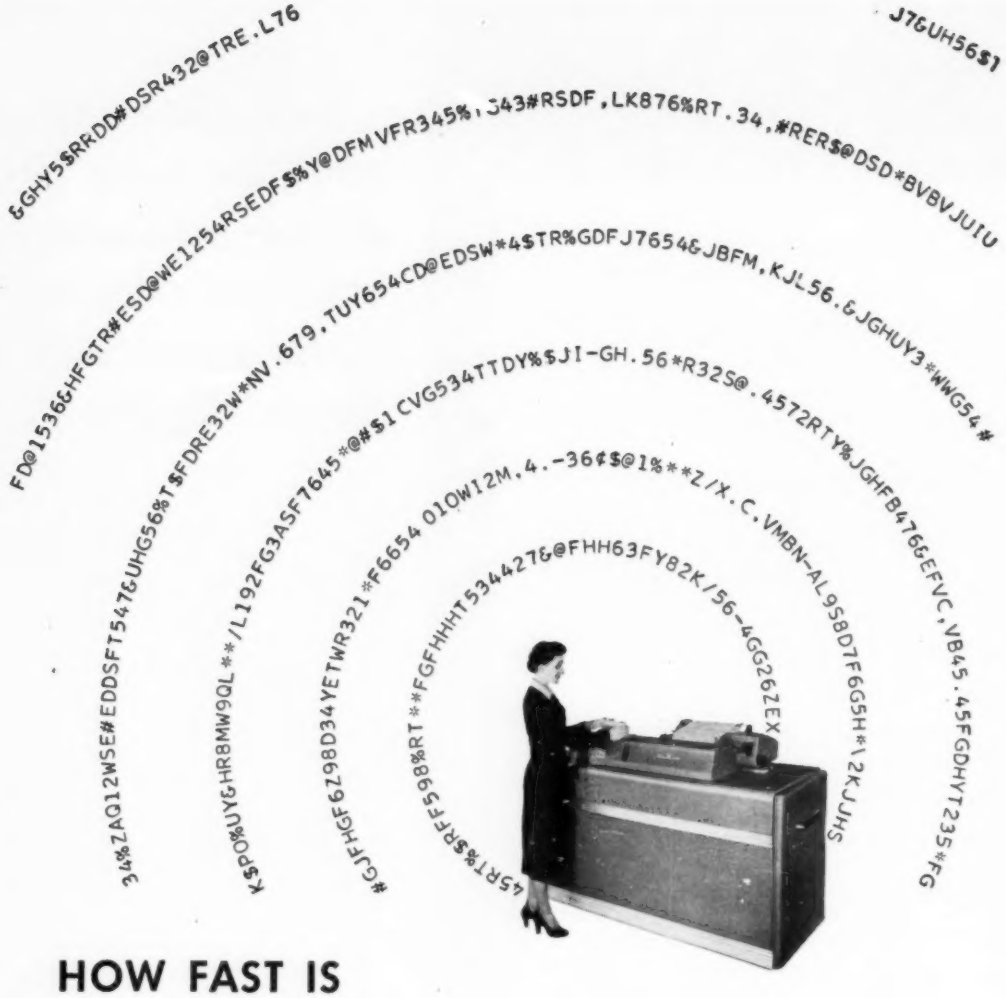
TT-L-54 (AMEND. 1)	Lacquer; Spraying, Acid-Resistant (for aluminum surfaces around storage batteries)
TT-L-58 (AMEND. 1)	Lacquer; Spraying, Clear & Pigmented (General Use)
TT-P-91a	Paint, Rubber-Base for Concrete Floors
TT-S-171	Sealer, Floor; Lacquer-Type (for oiled wood floors)
TT-T-266a	Thinner, Lacquer

Adhesives
Aircraft and Parts
Ammunition Boxes
Amphibious Equip.
Artillery
Automobiles
Automotive Parts
Bailey Bridges
Beds
Bombs
Bookcases
Buses
Business Machines
Camouflage
Canisters
Caskets
Cements
Chests
Chairs
Communications Equipment
Concrete
Containers
Decalcomanias
Desks
Dopes
Drums
Electrical Apparatus
File Cabinets
Fire Engines
Flares
Fuel Tanks
Gas Masks
Grenades
Guided Missiles
Guns
Gun Mounts
Hardware
Helmets
Home Power Tools
House Furnaces
Howitzers
Insignia
Jeeps
Landing Mats
Leather Goods
Lighting Fixtures
Lockers
Mines
Mortars
Office Equipment
Paper Goods
Pianos
Projectiles
Radio Cabinets
Rockets
Screens
Sealing Compounds
Shells
Shell Fuses
Skis
Sleds
Steel Drums
Store Fixtures
Tables
Tanks
Tank Trucks
Telephone Booths and Switchboards
Television Sets
Tin Cans
Tools and Boxes
Toys
Tractors
Trailers
Trucks
Vacuum Cleaners
Wall Panels
Wall Tiles
Wardrobes
Washing Machines

LACQUER is the most versatile of all finishes. It is easy to apply—by spray, brush, or dip. It dries in minutes. With hot-spray lacquer, one coat often can do the work of two. Hercules—the manufacturer of many raw materials that go into lacquers—will be glad to help you adapt the specification finishes listed at left to your industrial needs, or to discuss permissible modifications where government uses are concerned.

Cellulose Products Department
HERCULES POWDER COMPANY
915 King St., Wilmington 99, Del.

CL53-1



HOW FAST IS

18,000 Characters a Minute?

It's 24 times as fast as the fastest recorded typing speed . . . 128 times as fast as the average handwriting speed. But it's the *actual* speed at which the IBM 407 Accounting Machine, illustrated above, turns out accounting and statistical records for business and industry.

IBM Accounting Machines give you not only all the documents required in your daily accounting work, but—from the same punched cards—reports, statements, analyses, and other business records based on *fresh* information. With these in hand, you base your decisions on current facts.

Executives in many industries rely on this high-speed productive capacity of IBM machines to help them maintain effective business control.

IBM
TRADE MARK

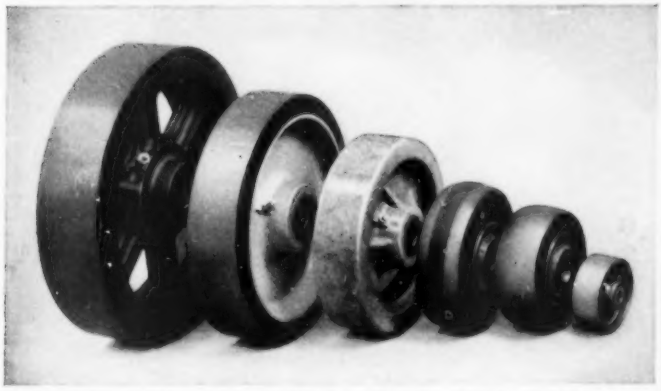
INTERNATIONAL BUSINESS MACHINES
590 Madison Avenue, New York 22, N. Y.

1000 ORDNANCE

MATERIALS-HANDLING NEWS

★ Panel Discussions by Bassick, World's Largest Manufacturer of Casters and Floor Protection Equipment ★

Bassick Industrial Wheels in Varied Types, Sizes Keep Needed Materials on the Move



At the bottom of things in any well-planned, fast-moving industrial operation, you'll find a need for Bassick wheels. Available in a wide range of sizes and types to meet any requirement, Bassick Industrial Wheels make it easier to keep materials parts moving on schedule. They save manual effort because they roll easier and faster . . . save money because they're built to quality standards to deliver years of efficient performance.

Oncore

soft rubber tread vulcanized on high-strength semi-steel core. Roller bearings. Widely used wherever large-diameter wheels are required.
Sizes: 5 to 16 in.

Alcore

soft rubber tread vulcanized on special aluminum alloy core for light weight, easier rolling. Ball or roller bearings.
Sizes: 5 to 12 inches.

Canaphin

non-sparking solid wheel molded of macerated canvas and phenolic resin to resist severe shock, acids and extreme heat.
Sizes: 3 to 8 in.

Baco

soft rubber tread molded and bonded by special vulcanization process to solid core. Eliminates tire changes, protects floors. Roller or self-lubricating bearings. Ideal for light and medium service.
Sizes: 1¾ to 8 in.

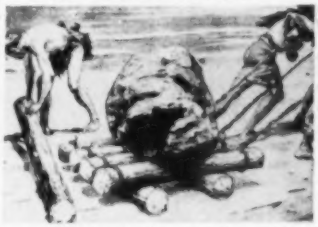
Atlasite

solid tread molded of special rubber and fiber compound. Carrying capacity equals that of metal wheels, with less floor wear and noise. Resistant to water, oil and most acids. Roller or self-lubricating bearings. Sizes: 1¾ to 8 in.

Biron

precision-made from powdered iron. Oil-impregnated self-lubricating bearings. The highest quality small metal wheels.
Sizes: 1¼ to 3 in.

Great-Grandpappy of The Modern Wheel



Big wheels, little wheels, wheels within wheels all stem from this primitive prototype which was Stone Age man's first attempt at materials-handling. Nobody knows who first discovered that it's easier to pull or push a load than carry it, but he set mankind on the road to progress when he hit upon the idea of using tree-trunks as rollers. Next stage in the history of the wheel was the solid wooden disc, followed around 1800 BC by the spoked wheel.

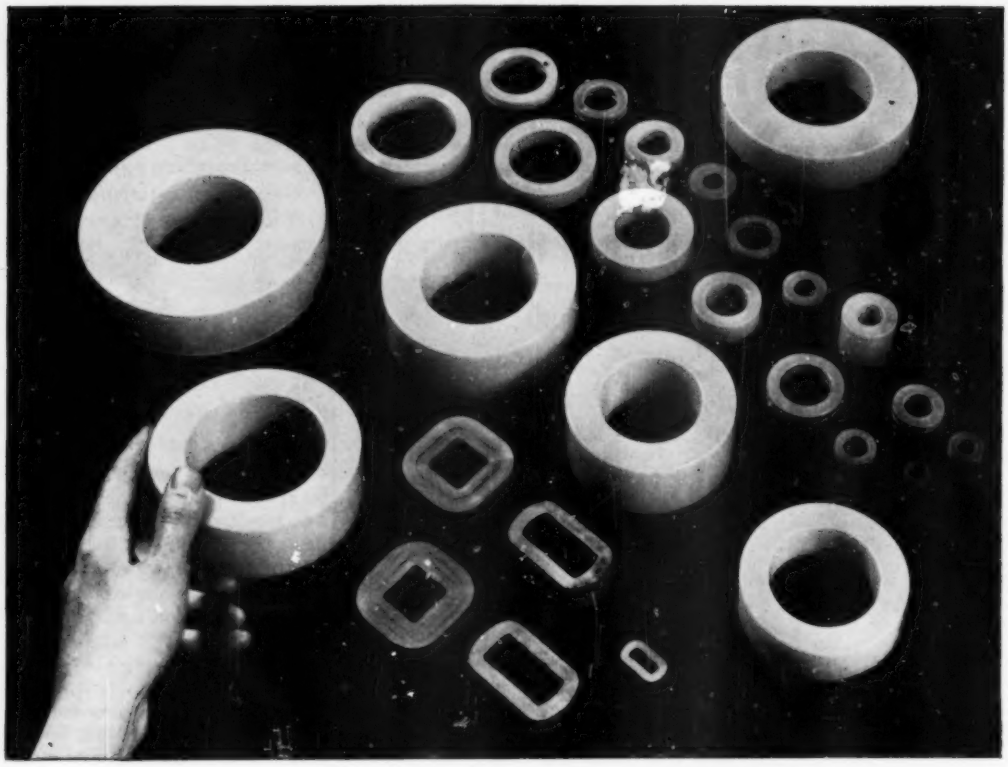
Still the basic working shape of our civilization, the wheel today is used in practically every kind of materials-handling equipment. Bassick industrial wheels are manufactured in a large variety of materials, sizes and capacities for use either as wheels or in casters. In both assignments, Bassick wheels roll fast and easily, and stand up under the toughest operating conditions.

To help keep your production rolling, call your Bassick industrial distributor for recommendations on the best Bassick wheel for the job. Or write directly to Bassick at the address below.

THE BASSICK COMPANY
Bridgeport 2, Conn.
In Canada:
Belleville, Ont.

Bassick
A DIVISION OF
STEWART WARNER SW

MAKING MORE KINDS OF CASTERS... MAKING CASTERS DO MORE



IN *TAPE-WOUND CORES*

JUST NAME YOUR REQUIREMENTS!

RANGE OF MATERIALS

Depending upon the specific properties required by the application, Arnold Tape-Wound Cores are available made of DELTAMAX . . . 4-79 MO-PERMALLOY . . . SUPERMALLOY . . . MUMETAL . . . 4750 ELECTRICAL METAL . . . or SILECTRON (grain-oriented silicon steel).

RANGE OF SIZES

Practically any size Tape-Wound Core can be supplied, from a fraction of a gram to several hundred pounds in weight. Toroidal cores are made in twenty-two standard sizes with protective nylon cases. Special sizes of toroidal cores—and all cut cores, square or rectangular cores—are manufactured to meet your individual requirements.

RANGE OF TYPES

In each of the magnetic materials named, Arnold Tape-Wound Cores are produced in the following standard tape thicknesses: .012", .008", .004", .002", .001", .0005", or .00025", as required.

Applications

Let us help with your problems of cores for Magnetic Amplifiers, Pulse Transformers, Current Transformers, Wide-Band Transformers, Non-Linear Retard Coils, Peaking Strips, Reactors, etc.

Address: ENG. DEPT. O

W&D 4613

THE ARNOLD ENGINEERING COMPANY

SUBSIDIARY OF ALLEGHENY LUDLUM STEEL CORPORATION

General Office & Plant: Marengo, Illinois

DISTRICT SALES OFFICES

New York: Empire State Bldg. Los Angeles: 3450 Wilshire Blvd.

It's No Problem...

TO FEED THIS BABY!

When you're W-S Equipt

It's a far cry from Arsenal, USA to Target, Korea. That's why it's essential, not *only* to make every shot count in the field, but in the factory, too . . . streamline and perfect every operation subsidiary to the main objective of a free world.

That's the kind of efficiency you are *sure* of when Watson-Stillman ordnance presses take over your cannon-fodder problem. Smooth, quiet operation, ultimate flexibility of control, minimized rejects, and the speed-*with*-efficiency required by modern warfare.

For *your* expanding ordnance requirements—consult Watson-Stillman first . . . experts in transforming *hydraulic* power into *fire* power.

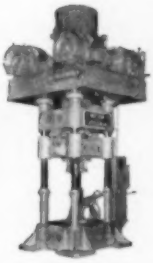
Cold Extrusion Press

Shell Piercing Press

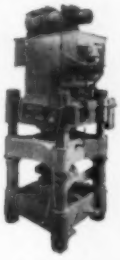
Shell Bander

W-S HYDRAULIC

ESTABLISHED 1848



Shell Nosing Press



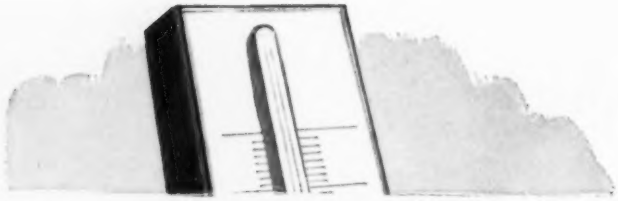
Billet Breaker

THE WATSON-STILLMAN COMPANY

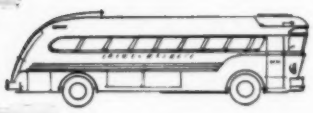
DIVISION OF H. K. PORTER COMPANY, INC.

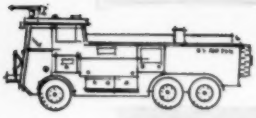
164 ALDENE RD., ROSELLE, NEW JERSEY

9-0-52

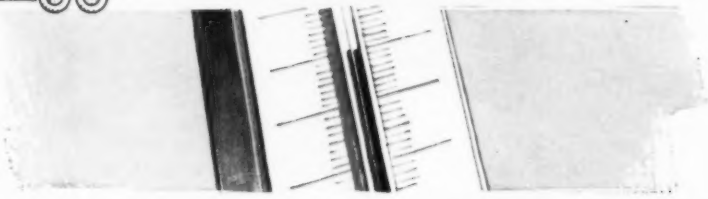


ALL-WEATHER

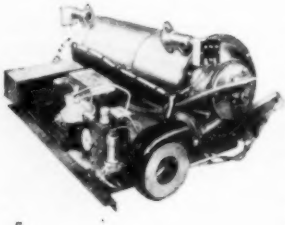




OPERATION ASSURED



with JANITROL LIQUID HEATERS



It's a cold hard fact that *reliable operation in any weather*—right down to 65° below zero—is a tough spec for any vehicle. But it's a requirement that can be met in full with Janitrol liquid heaters—as severe tests have proved repeatedly. On the USAF bomber tow tug built by Euclid Road Machinery Company, for example, positive starting was accomplished without special fuel capsules at –65°F after a 72-hour cold soak, and engine temperature jumped to the 155° to 165°F range well within 60 minutes.

If you're responsible for protecting investments in any vehicles or stationary engines or mobile power plants, gasoline or diesel powered, you'll do well to look into the 6-year long record of Janitrol liquid heater reliability. Your nearest Janitrol representative is always at your service.

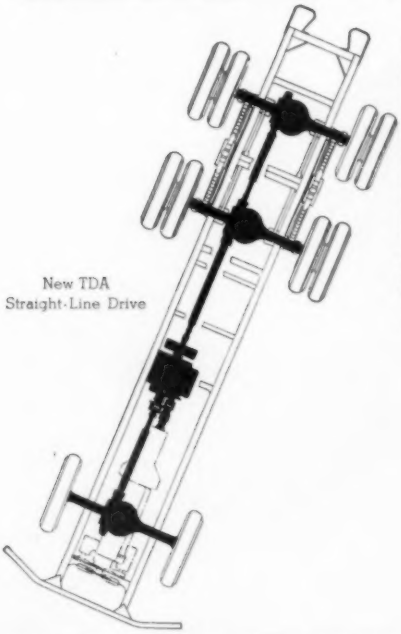
HEAT WHEREVER YOU WANT IT

Janitrol

AIRCRAFT-AUTOMOTIVE DIVISION SURFACE COMBUSTION CORP., TOLEDO 1, OHIO

F. H. Scott, 225 Broadway, New York, N. Y. • C. B. Anderson, 2509 W. Berry St., Ft. Worth, Tex. • L. A. Curtin, 7046 Hollywood Blvd., Hollywood, Calif. • F. H. Scott 4650 East-West Highway Washington, D. C. • Phil A. Miller; Frank Deak, USAF Coordinator, Central District Office, 400 Dublin Ave., Columbus, Ohio • Headquarters, Toledo, Ohio

Making the best just a little bit better!



New TDA
Straight-Line Drive

Realizing that today's "best" is often obsolete tomorrow, TDA is constantly developing new improvements in military truck axle design and construction. For instance, the new TDA Straight-Line Drive for the 2½-ton 6x6 military truck has improved performance under all load, road and speed conditions.

This new design (shown at left) features a straight-line drive from the front axle through the transfer case to *both* rear axles. This is possible because top-mounted double-reduction final drives are used in all *three* axles. Not only is ground clearance increased, but propeller shaft angles are reduced both vertically and horizontally. In addition, parts interchangeability is greatly increased.

Since before World War I, TDA has been working in close cooperation with the Armed Services to "improve the best." This never-satisfied attitude today will mean ever finer vehicles tomorrow.

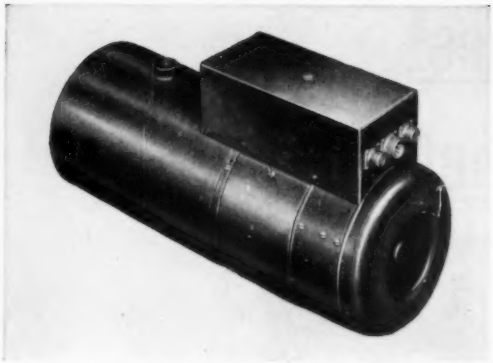
The Accepted TDA Standard

AXLES

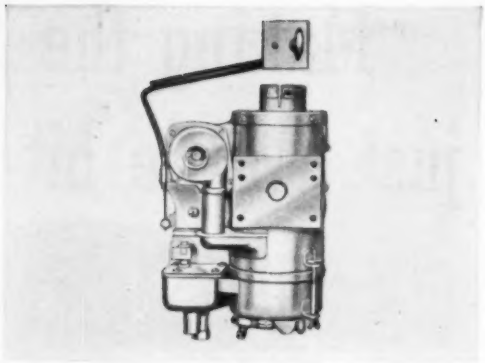
THE TIMKEN-DETROIT AXLE COMPANY
DETROIT 32, MICHIGAN

WORLD'S LARGEST MANUFACTURER OF AXLES FOR TRUCKS, BUSES AND TRAILERS

PLANTS AT: DETROIT AND JACKSON, MICH. • OSHKOSH, WIS. • UTICA, N. Y. • ASHTABULA, KENTON AND NEWARK, OHIO • NEW CASTLE, PA.



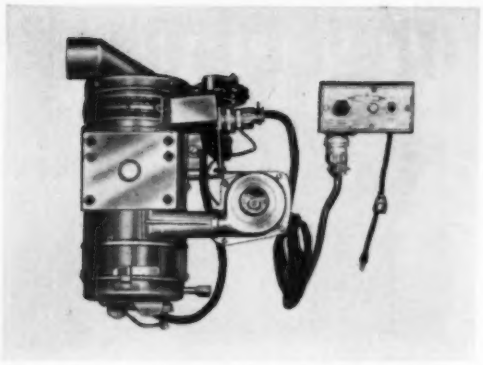
Model E-511 Coolant Heater for liquid-cooled gasoline and diesel engines. Delivers 60,000 B.t.u. per hour.



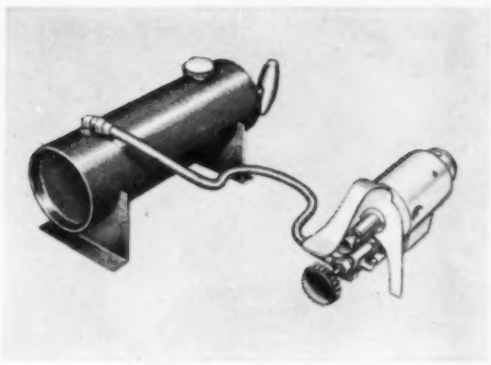
Series 460 Coolant and Direct-Fired Engine Heater. Each heater is a complete package requiring only electric, fuel, coolant and exhaust connections.

Everything anybody needs for

New! Perfection Fresh-Air Heater for Gasoline or Diesel Engines. Delivers more actual fresh-air heat than any other heater of this type. Four models. Fresh-air output from 20,000 B.t.u./Hr. to 90,000 B.t.u./Hr.



Series 590 Coolant and Direct-Fired Engine Heater. Independent mounting of fuel pump and control valve provides maximum flexibility of installation.



"Super-Jet" Blow Torch. Starts and performs efficiently even at 70 degrees below. Easily portable. Giant heat output of 75,000 B.t.u./Hr.

personnel, cargo, engine heating

If you're building or putting equipment into service for operation in sub-zero or Arctic temperatures . . . call on Perfection. Our skilled staff of winterization experts knows more about combatting cold than the Eskimos. For more than 10 years, Perfection engineers have worked constantly developing and producing the finest and most complete line of heaters and winterization kits in the business. Now, whether your particular problem is personnel heating, engine pre-heating for starting or stand-by operation, space or cargo heating or heating for defrosting, Perfection can recommend and guarantee the equipment or system that's just *right* for *your* job. And there are no "bugs" in Perfection equipment because it is pre-tested to military specifications in our Arctic Laboratory. Write or wire for complete information.

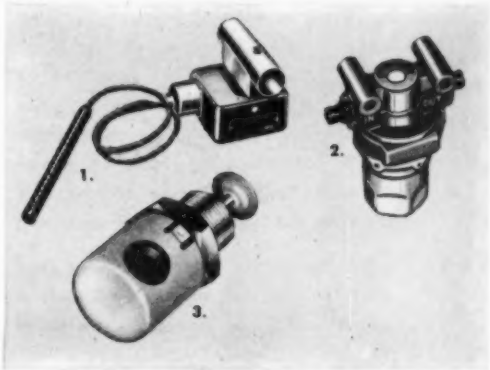
PERFECTION STOVE COMPANY, 7390-B Platt Avenue, Cleveland 4, Ohio

Perfection

headquarters for

Personnel Heating
Space or Cargo Heating
Engine Heating
Defrosting

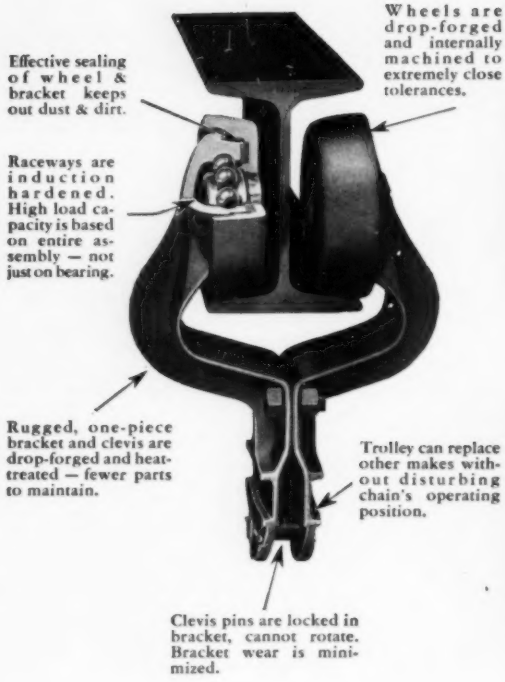
Model E-600 Portable Heater. 60,000 B.t.u. fresh-air output. Meets the need for a *complete* heating unit that is easily portable.

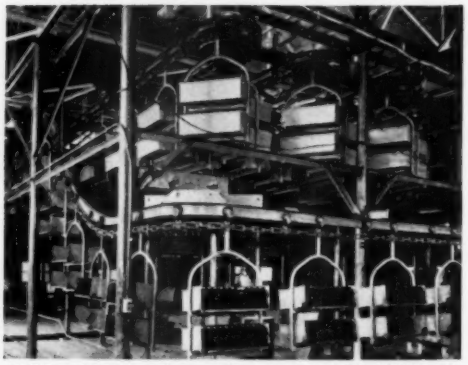


Heater Accessories. Complete line of quality accessories including, (1) Overheat Control, (2) Fuel-line Filter, and (3) Oil Thermostat.

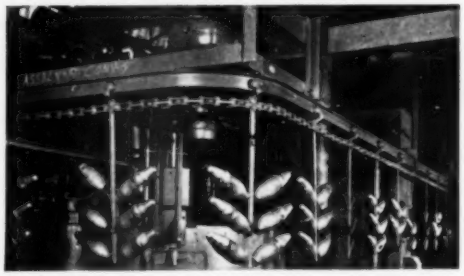
When you buy TROLLEY CONVEYORS why not get BOTH?

Superior components PLUS Engineering ingenuity


Effective sealing of wheel & bracket keeps out dust & dirt.
Wheels are drop-forged and internally machined to extremely close tolerances.
Raceways are induction hardened. High load capacity is based on entire assembly — not just on bearing.
Rugged, one-piece bracket and clevis are drop-forged and heat-treated — fewer parts to maintain.
Trolley can replace other makes without disturbing chain's operating position.
Clevis pins are locked in bracket, cannot rotate. Bracket wear is minimized.



Building 3.5-inch rockets, modern version of World War II bazooka, with the help of Link-Belt Overhead Trolley Conveyors. This parts storage conveyor, 600 feet long, has 180 carriers, spaced 40 inches apart.



Steel bodies for these 3.5-inch rockets are carried on this 112-foot-long Link-Belt Overhead Trolley Conveyor. The carriers, spaced 30 inches apart, were also made by Link-Belt.

You can make your overhead trolley conveyor dollars go farther by calling in Link-Belt while you're still in the planning stage. Link-Belt makes the finest trolley on the market today. Equally important, our specialists can draw on the world's largest, most varied background of conveying and power transmission application.

Bringing parts to workers and taking them away. Drawing raw materials from stock at correct intervals. Synchronizing operations to eliminate bottlenecks.

Link-Belt Overhead Trolley Conveyors do all these jobs to release valuable manpower for productive work . . . to increase output. And they free floor space, too.

Why not have a Link-Belt engineer help you and your consultants plan peak production results? Write for Book 2330 for all the facts.

LINK-BELT

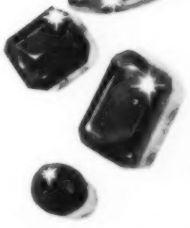
OVERHEAD TROLLEY CONVEYORS

LINK-BELT COMPANY: Chicago 8, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,411-A

UNITED

35,000 TON FORGING PRESS

ONE of two new 35,000 ton hydraulic forging presses being built by UNITED for the USAF Heavy Press Expansion Program to help bring the United States to a commanding position in the production of modern aircraft for the armed services.



UNITED

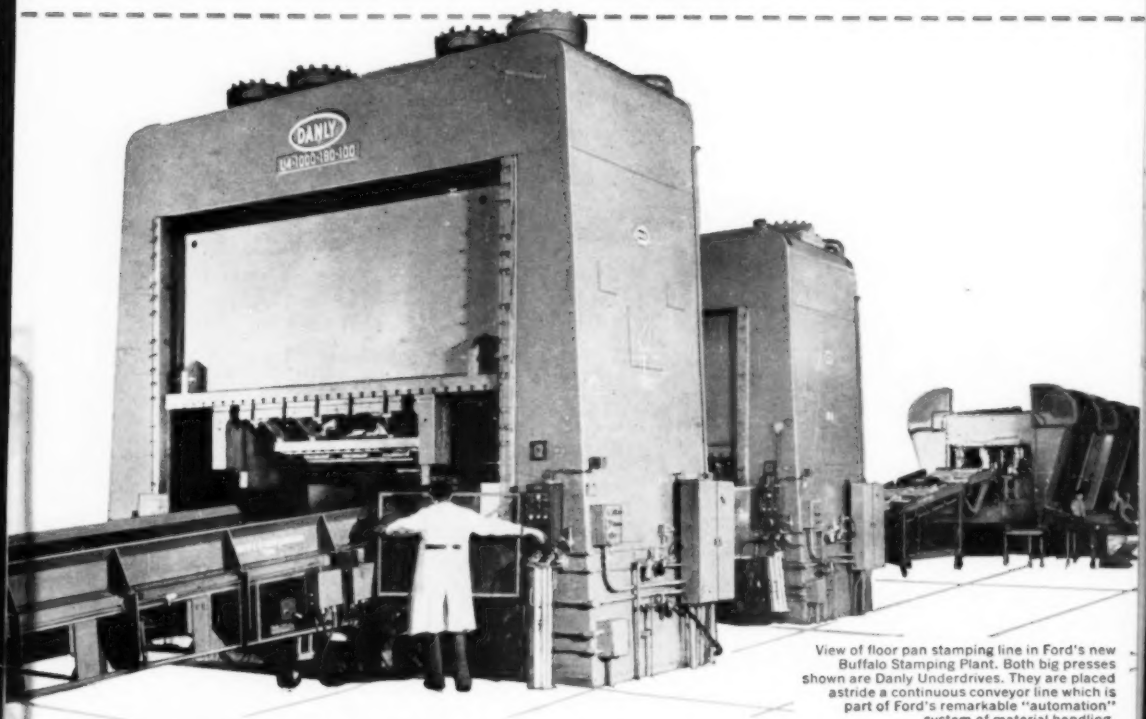
ENGINEERING AND FOUNDRY COMPANY

Pittsburgh, Pennsylvania

Plants at Pittsburgh • Vandergrift • New Castle • Youngstown • Canton
Subsidiaries: Adamson United Company, Akron, Ohio
Labdell United Company, Wilmington, Delaware
Stedman Foundry and Machine Company, Inc., Aurora, Indiana

Designers and Builders of Ferrous and Non-Ferrous Rolling Mills, Mill Rolls, Auxiliary Mill and Processing Equipment, Presses and other heavy machinery. Manufacturers of Iron, Nodular Iron and Steel Castings and Weldments.

the "ANCHOR MEN" of the production team



View of floor pan stamping line in Ford's new Buffalo Stamping Plant. Both big presses shown are Danly Underdrives. They are placed astride a continuous conveyor line which is part of Ford's remarkable "automation" system of material handling.

DANLY PRESSES

help Ford maintain uninterrupted output

Non-stop production is the watch word in Ford's huge new stamping plant located at Buffalo, New York. With efficient, minimum cost operation they're turning out approximately 40% of all Ford stampings.

Up and down all 19 major stamping lines you'll find Danly Presses . . . because Danly Presses are specifically designed and constructed for continuous production. With exclusive features like the Cool Running Danly Clutch and automatic pressure lubrication these presses are setting new uninterrupted production records . . . not only at Ford, but in the leading stamping plants throughout the country.

If you're looking for top production—be sure to check the performance records of Danly Presses and see why . . .

DANLY

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue
Chicago 50, Illinois

It costs less to run a DANLY PRESS!

Single Action Straight Side

Autofeed

Underdrive Single, Double, Triple Action

Gap Frame

Double Action Straight Side

MECHANICAL PRESSES . . . 50 TO 3000 TONS — HYDRAULIC METALWORKING EQUIPMENT

Whenever you have a tough job
that requires engineering and production know-how
plus proven ability to maintain quality
and meet production schedules
call upon
AERIAL PRODUCTS, Inc.
ELKTON, MARYLAND
For over a decade our entire organization and facilities have
been devoted exclusively to the design and production of
FLARE AND SIGNAL MUNITIONS
PHOTOFLASH MUNITIONS
DETONATOR AND BURSTER COMPONENTS
FOR AMMUNITION
* * *
SHELL AND FUZE LOADING
* * *
Inventors and Sole Manufacturers
of the Universally Accepted
SIGNAL (DISTRESS DAY AND NIGHT)
AN-MARK 13 MOD 0
The Standard Distress Signal
of the U. S. Armed Forces

Light Castings . . . These piston rings are produced in Ni-Resist for engines used in corrosive service.

Investigate NI-RESIST . . .

No other cast metal provides such a unique combination of useful engineering properties

NI-RESIST® is available nationwide in 5 basic types to meet a variety of industrial demands: resistance to corrosion, heat and wear; strength and toughness; good machinability; high electrical resistance and non-magnetic characteristics . . . as well as heat conductivity and controlled thermal expansion.

At the present time, nickel is available for the production of Ni-Resist and other alloys containing nickel, for end uses in defense and defense supporting industries. The remainder of the supply is available for some civilian applications and governmental stockpiling.

Medium Castings . . . Free from tendencies to corrode, comminutor parts cast in Ni-Resist lengthen life of sewage disposal equipment.

Heavy Castings . . . Casing, outer column and discharge head of this 14-ton pump are cast in Ni-Resist for resistance to salt water and other corrosive media.

SOURCES OF SUPPLY FOR NI-RESIST CASTINGS

EASTERN SECTION...

Abrasive Alloy Castings Co.
Bridgeboro, N. J.

American Abrasive Metals Co.
Irvington, N. J.

American Brake Shoe Co.
230 Park Avenue
New York 17, N. Y.

American Brake Shoe Co.
Engineered Castings Division
10 Mt. Read Blvd.
Rochester 11, N. Y.

American Chain & Cable Co., Inc.
Acco Casting Division
Reading, Pa.

The Baldwin-Lima-Hamilton Corp.
Eddystone Division
Paschall P. O.
Philadelphia 42, Pa.

Barnett Foundry & Machine Co.
536 Lyons Avenue
Irvington, N. J.

Curtiss-Wright Corp.
Metals Processing Division
162 Grider Street
Buffalo 11, N. Y.

Hunt-Spiller Manufacturing Corp.
383 Dorchester Avenue
South Boston 27, Massachusetts

Janney Cylinder Co.
7425 State Road
Philadelphia 36, Pa.

Koppers Company, Inc.
Metal Products Division
Bush & Hamburg Streets
Baltimore 3, Maryland

Kutztown Foundry & Machine Corp.
Kutztown, Pa.

Montague Machine Company
Turners Falls, Massachusetts

Olney Foundry, Link-Belt Co.
180 W. Duncannon Avenue
Philadelphia 20, Pa.

The Richmond Foundry & Mfg. Co., Inc.
Hermitage Road
Richmond 20, Virginia

The Taylor & Fenn Co.
Saville Street
Windsor, Connecticut

Weatherly Foundry & Mfg. Co.
Weatherly, Pa.

MIDDLE SECTION...

American Brake Shoe Co.
Electro-Alloys Division
1936 Taylor Street
Elyria, Ohio

American Cast Iron Pipe Co.
P. O. Box 2603
Birmingham 2, Alabama

Baker Perkins, Inc.
1000 Hess Street
Saginaw, Michigan

Carondelet Foundry Co.
2101 S. Kingshighway
St. Louis 10, Mo.

Chicago Hardware Foundry Co.
2500 Commonwealth Avenue
North Chicago, Illinois

DeZurik Shower Co.
Foundry Division
Sartell, Minnesota

Duluth Brass Works Co.
5002 Ramsey Street
Duluth, Minnesota

The Duriron Co., Inc.
Dayton 1, Ohio

Engineering Castings, Inc.
405 South Linden
Marshall, Michigan

The Fahralloy Company
150th St. & Lexington Ave.
Harvey, Illinois

Frank Foundries Corp.
2020 Third Avenue
Moline, Illinois

The Hamilton Foundry & Machine Co.
1551 Lincoln Avenue
Hamilton, Ohio

Kingsport Foundry & Mfg. Corp.
East Sullivan and Main Streets
Kingsport, Tennessee

Michiana Products Corp.
P. O. Box 302
Michigan City, Indiana

Michigan Steel Casting Co.
1999 Guoin Street
Detroit 7, Michigan

Moran Flexible Joint Co., Inc.
215 West Main Street
Louisville 2, Kentucky

Reda Pump Co.
Bartlesville, Oklahoma

Ross-Meehan Foundries
1601 Carter Street
Chattanooga 1, Tennessee

St. Paul Foundry & Mfg. Co.
500 Como Avenue
St. Paul 3, Minnesota

Service Foundry Division
Avondale Marine Ways, Inc.
416 Erato Street
New Orleans 13, Louisiana

Shenango-Penn Mold Co.
Dover, Ohio

Standard Brass & Mfg. Co.
P. O. Box 1469
Port Arthur, Texas

The Sterling Foundry Co.
Wellington, Ohio

Texaloy Foundry Co.
1407 Hoefgen Avenue
San Antonio 3, Texas

The W. S. Tyler Co.
3615 Superior Avenue
Cleveland 14, Ohio

Wells Manufacturing Co.
7800 North Austin Avenue
Skokie, Illinois

WESTERN SECTION...

Centrifugal Casting Co.
3245 Cherry Avenue
Long Beach 7, California

Dameron Metal Sales Co.
927 South Sante Fe Avenue
Compton, California

Electric Steel Foundry Co.
2141 North West 25th Avenue
Portland 10, Oregon

Pacific Foundry Co., Ltd.
3100 19th Street
San Francisco 10, California

Stanley Foundries
6009 Sante Fe Avenue
Huntington Park, California

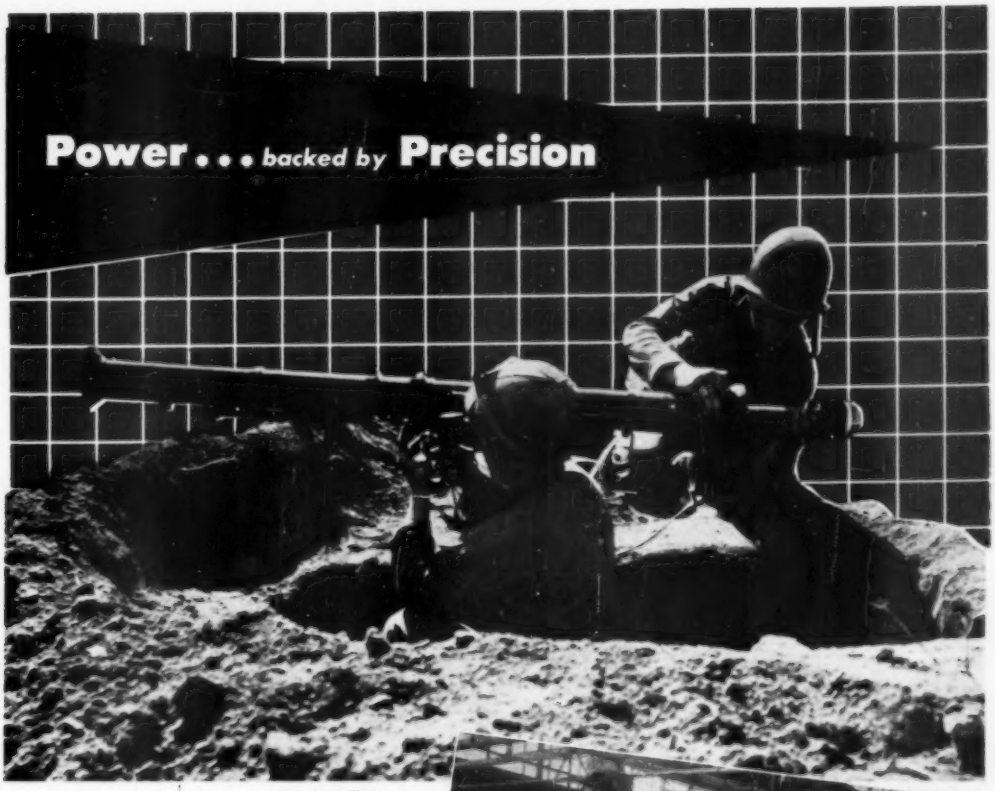
Utility Steel Foundry
3320 East Slauson Avenue
Vernon (L. A.) California

INCO

THE INTERNATIONAL NICKEL COMPANY, INC.

67 WALL STREET
NEW YORK 5, N. Y.

Power . . . backed by Precision



U.S. Army Photo

The destructive power of many of the weapons used on the firing line in Korea depends upon production line precision for penetrating power and effectiveness.

The press production lines at Eastern Tool & Mfg. Co. are producing precision made deep-drawn components in copper and steel for use in bazooks and similar weapons. Wall tolerances are maintained as closely as .001".

We invite interested ordnance contractors to submit specifications to our engineering staff.

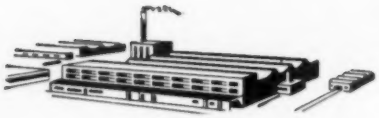
Section of Eastern Tool Mfg. Co. press production line.

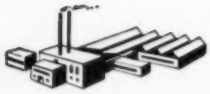
Eastern Tool & Mfg. Co.

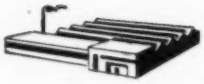
Belleville 9, New Jersey

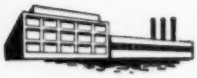
Send for our new 24 page descriptive booklet.

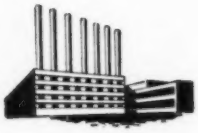
Wire Forming • Metal Stamping • Deep-Drawing











PRODUCTS and FACILITIES Serving Many Industries

Pressed Steel Car Company offers a broad range of products and services available to industry throughout the world. Always alert to new processes and technological advances Pressed Steel Car Company throughout the years has maintained a reputation for more efficient, higher quality products.

ALL OUTSTANDING PERFORMERS — *these products range from . . . . . .*

- *Locomotives and trackwork to cookware*
- *Agricultural and farm machines to milk cans*
- *Railroad and industrial cars to oil pumping machinery*
- *Industrial trailers and engine lathes to conduit fittings*
- *Steel tanks to milk can washing machines*
- *Power plants to cellular laminated containers and shelters*

PRESSED STEEL CAR COMPANY INCORPORATED

6 No. Michigan Avenue, Chicago, Illinois

New York
Chicago
Buffalo
Los Angeles
Honolulu
London
Mexico City
Manila
San Juan

NEED TANK ARMOR CASTING COMPONENTS?

National's Facilities *Now Available!*

National is now producing tank armor castings for three of the largest prime contractors, and, because of our recent expansion program we have additional facilities ready to produce for you.

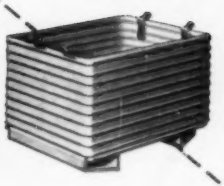
Our experience in producing sound castings is your assurance of quality that will more than meet your expectations. Metallurgical skill used in the production of rolls and castings for the steel producing industry during the last forty-five years was utilized for the production of tank armor castings during World War II. In 1950, when the need for tanks and other armored vehicles was critical, National was one of the few companies equipped to meet the needs of the Ordnance Corps. For the past two years, National has been producing the heavy M-47 rear hull casting and various armor components for the Patton M-48.

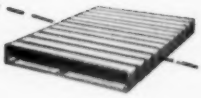
We would like to put our facilities and experience to work for you. Let us know what components you require. Write, wire or phone us.

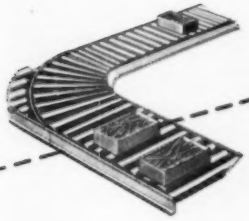
THE NATIONAL ROLL & FOUNDRY CO. • Avonmore, Pennsylvania

Unfair to non mechanized BEAVERS
On land and sea, I used to be reknowned for toil and industry. But now, alas, my efforts look meager, compared to that tireless "EAGER BEAVER"

REO MOTORS, INC., LANSING 20, MICHIGAN







Handle materials better, more cheaply, with equipment made of

N·A·X

HIGH-TENSILE STEEL

Minimum product weight and long product service are just two important reasons why N-A-X HIGH-TENSILE steel is ideally suited for tote boxes, pallets, conveyors, lift trucks, and other equipment used for transporting materials.

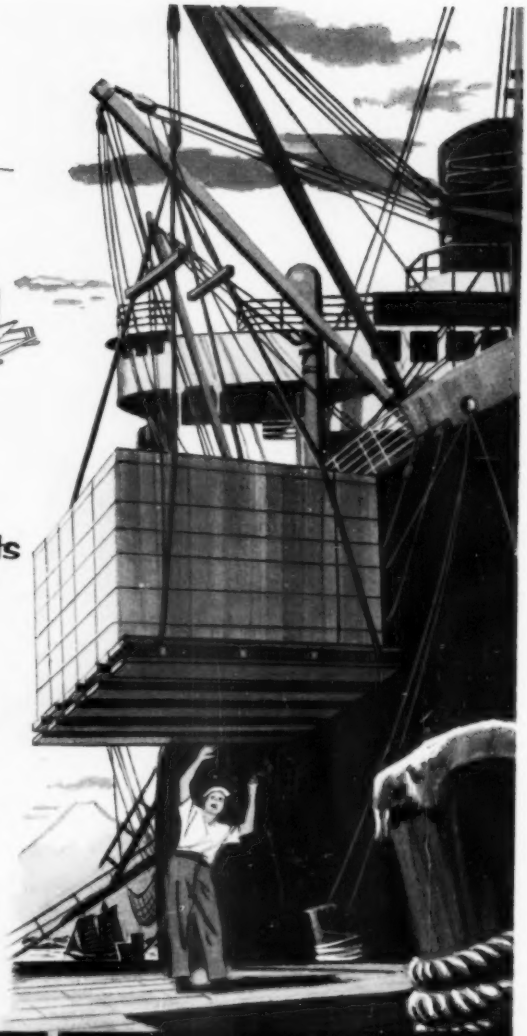
Because N-A-X HIGH-TENSILE steel has exceptional strength and durability, thinner sections can be used, yet it resists abrasion, impact, fatigue, and corrosion. N-A-X HIGH-TENSILE steel gives your equipment longer life and reduces deadweight to the minimum; you can carry a greater net load of material with no increase in the gross load weight. And N-A-X HIGH-TENSILE steel has exceptional welding and fabricating qualities – important advantages where custom-made materials-handling equipment is required.

If you are interested in better, more economical materials-handling, why not investigate N-A-X HIGH-TENSILE steel *now?*

GREAT LAKES STEEL CORPORATION

N-A-X Alloy Division • Ecorse, Detroit 29, Michigan

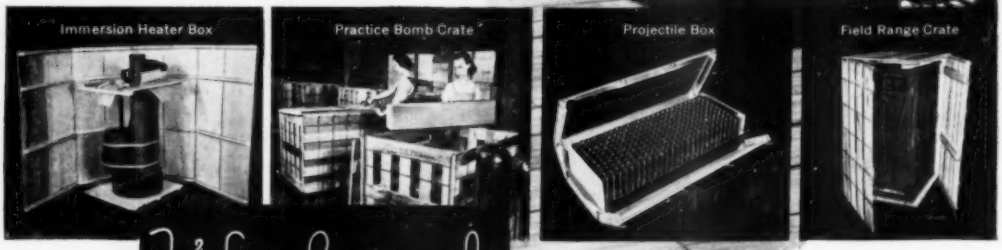
NATIONAL STEEL CORPORATION



Everyday more and more service shipments go **WIREBOUND**

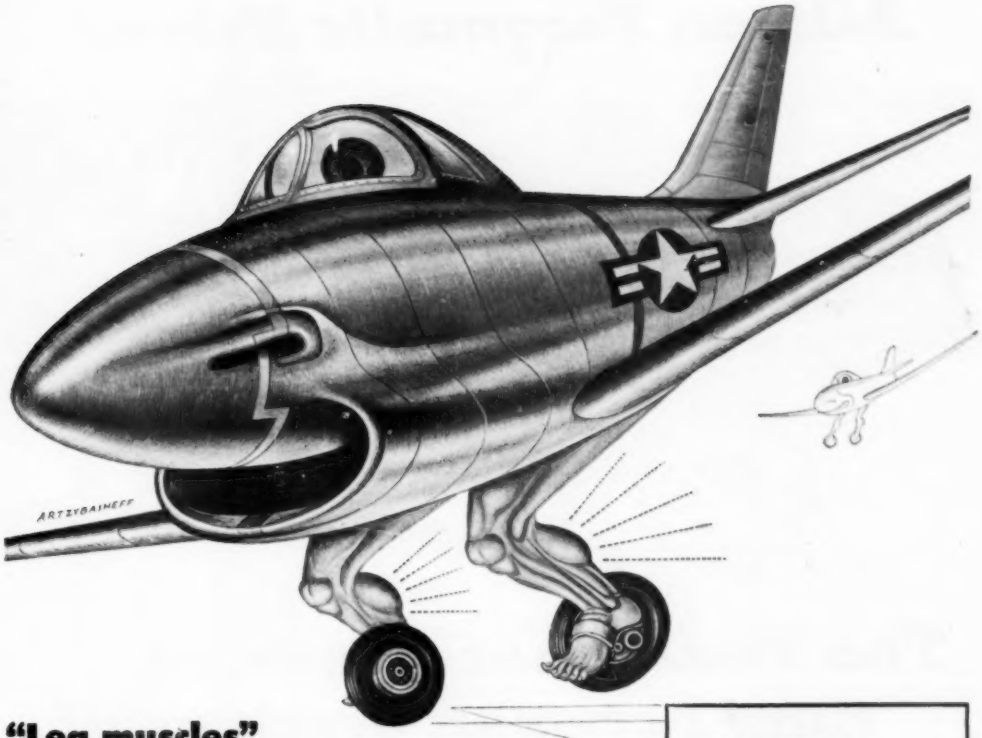
An ever increasing number of suppliers are taking advantage of improved Military and Federal specifications so that they may obtain the benefits of Wirebound containers for Armed Service shipments. They've found Wirebound box manufacturers well qualified to supply containers that meet government requirements for parts, equipment, over-packs, food and hundreds of other uses. Wirebound plants throughout the country are up-to-date on Armed Service shipping specifications and have the experience, technical know-how and testing facilities to produce the best container for each use. Why not check with your Wirebound supplier or write for full information!

Wirebound Box Manufacturers Association
Room 1162, 327 South LaSalle Street, Chicago 4, Illinois



Wirebound
BOXES & CRATES

75 WIREBOUND BOX PLANTS are ready to serve you!



"Leg muscles" that cushion a jet's landing

When the landing gear of an F-86 Sabrejet hits the runway at lightning speed, the shock is absorbed by hydraulic action within the tough, precision-made cylinder on each "leg." To machine these 37-lb. cylinders to exact tolerances from solid 158-lb. steel forgings . . . to give them mirror-smooth inside finishes . . . Cleveland Pneumatic depends on Lycoming.

If *your* metal-working needs—like Cleveland Pneumatic's—can be solved by precision production, or if your problem is volume fabrication, or "just an idea" in the rough or blueprint stage—*look to Lycoming*. Long famous for metal-working skills, Lycoming meets the toughest specifications of exacting customers, both industrial and military.

Lycoming's 2½ million square feet of floor space, its more than 6,000 machine tools, and its wealth of creative engineering talent all stand ready to serve your needs.

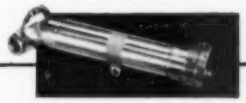
AIR-COOLED ENGINES FOR AIRCRAFT AND INDUSTRIAL USES • PRECISION-AND-VOLUME MACHINE PARTS • STEEL-PLATE FABRICATION

FOR RESEARCH · FOR PRECISION PRODUCTION

LOOK TO LYCOMING

LYCOMING-SPENCER DIVISION, WILLIAMSPORT, PA.
BRIDGEPORT-LYCOMING DIVISION, AVCO, STRATFORD, CONN.

For main leg cylinders that enable a Sabrejet to absorb the jolt of high-speed landings—Cleveland Pneumatic looks to Lycoming's precision production



Lycoming-Spencer Division
AVCO Manufacturing Corp.
652 Oliver Street
Williamsport, Pa.

Please send me further information on Lycoming's varied abilities and facilities.

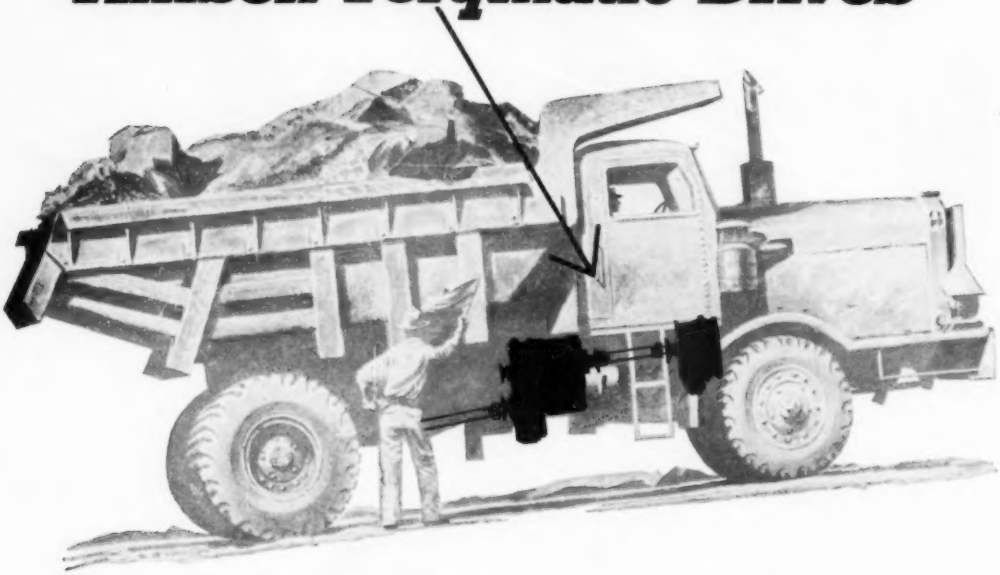
Name_____

Firm_____ Title_____

Address_____

City_____ Zone____ State____

Allison Torqmatic Drives



The Team that stretches time between overhauls!

Operators of heavy-duty, off-highway trucks soon find in their cost records that Allison TORQMATIC Converters and TORQMATIC Transmissions extend time between overhauls and help cut repair bills amazingly.

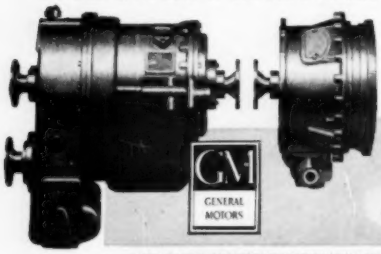
Allison TORQMATIC DRIVES match the engine power to the loads. Maximum engine horsepower can be utilized throughout the entire haul cycle, thus eliminating harmful shocks, lugging and stalling.

TORQMATIC DRIVES also cut operating costs because they take out much of the human element in driving the vehicles—gearshift guess and gearbox clash are things of the past. Allison TORQMATIC DRIVES "quick shift" hydraulically at full throttle by a flick of a simple control lever.

Send for the Allison pamphlet completely describing these Drives and learn more about their broad application to heavy-duty equipment.

ALLISON DIVISION OF GENERAL MOTORS
Box 89400, Indianapolis 6, Indiana

MATCHED UNITS BUILT BY ONE MANUFACTURER



Allison TORQMATIC DRIVES

COMPACT, EFFICIENT HYDRAULIC DRIVES FOR TRUCKS * CRANES * TRACTORS * SCRAPERS * SHOVELS * DRILLING RIGS

5 million — **3.5″ ROCKET MOTOR METAL PARTS ASSEMBLIES**

4 million — **57-mm. RECOILLESS RIFLE SHELLS (M-306 A-1)**

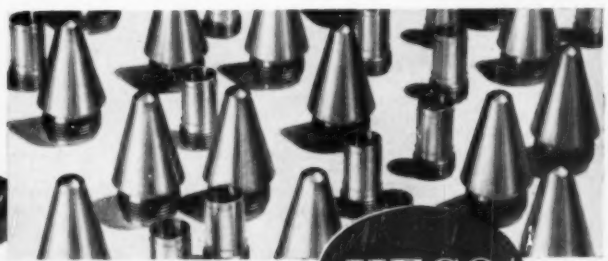
15 million — **M-75 (20-mm.) FUZES**

To our friends in Army Ordnance, our sincere thanks for having made this achievement possible.

We take pride in the fact that Ordnance gave ·HECO· the responsibility of developing the mass production technique for the 3.5″ Rocket Motor and the 57-mm. (M-306 A1) "bar stock" shell. This enabled us to be the first volume producers of these items "on stream" when Korea erupted.

We believe that these accomplishments by a relatively small company prove again the efficiency of the Ordnance-Industry team.

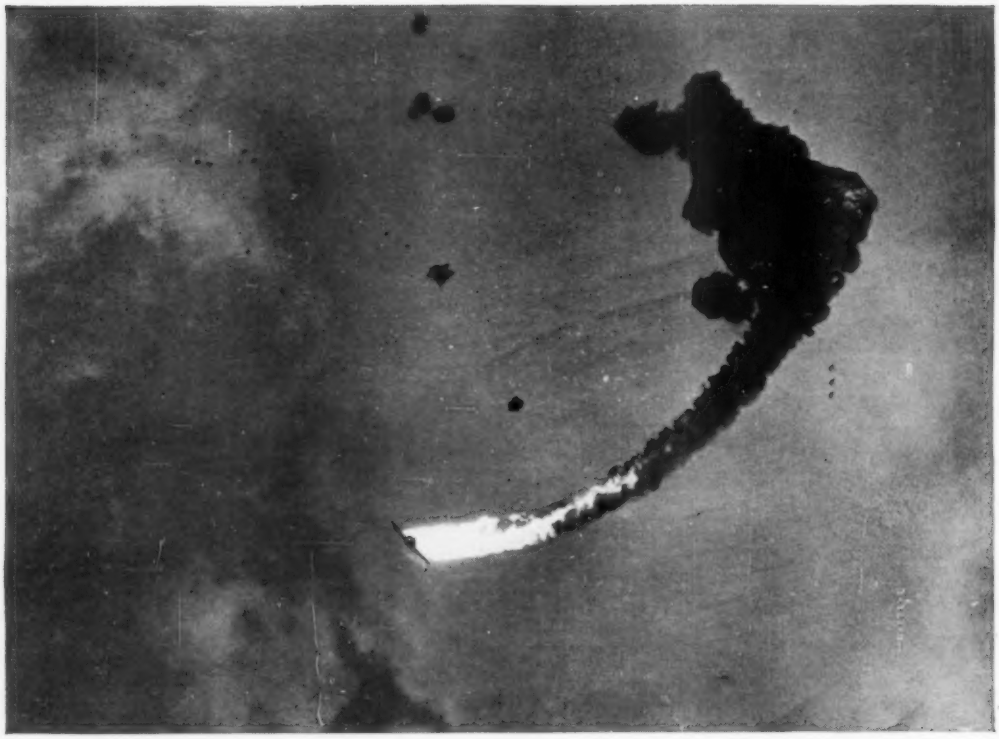
Thank you, Gentlemen.



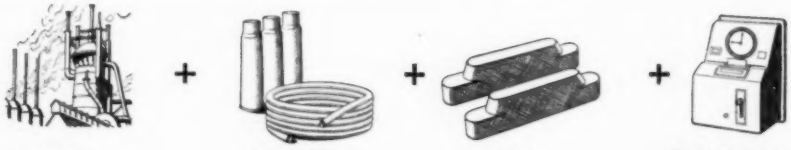
HECKETHORN MANUFACTURING & SUPPLY CO.
Littleton, Colorado

CONTRACTORS TO THE UNITED STATES ARMED FORCES FOR ROCKETS, SHELLS, FUZES, RESEARCH AND DEVELOPMENT

·HECO· *Means Business*



What it takes to pick off a "bird of destruction"!



Carbon Steel
44,469 lbs.

Copper and Brass
3,956 lbs.

Nickel
140 lbs.

Machine Operation
30,000 hours

All these elements add up to just one anti-aircraft unit! An aircraft carrier requires a battery of 20 to provide the principal protective cover from air attack.

American Machine & Foundry Company produces certain component mechanisms that perform a critical role in the operation of these anti-aircraft units. Here again, by working closely with the Naval Bureau of Ordnance, AMF's engineering ability and manufacturing facilities help to supply the answer to a vital need.

This is only one example of the job American industry is doing to insure effective military preparedness. Only by producing better products faster through individual *speed* and *skill* can we keep our nation militarily alert.

Above figures given with due regard for security.

AMERICAN MACHINE & FOUNDRY COMPANY

Executive Offices, 511 Fifth Avenue, New York 17, N. Y.

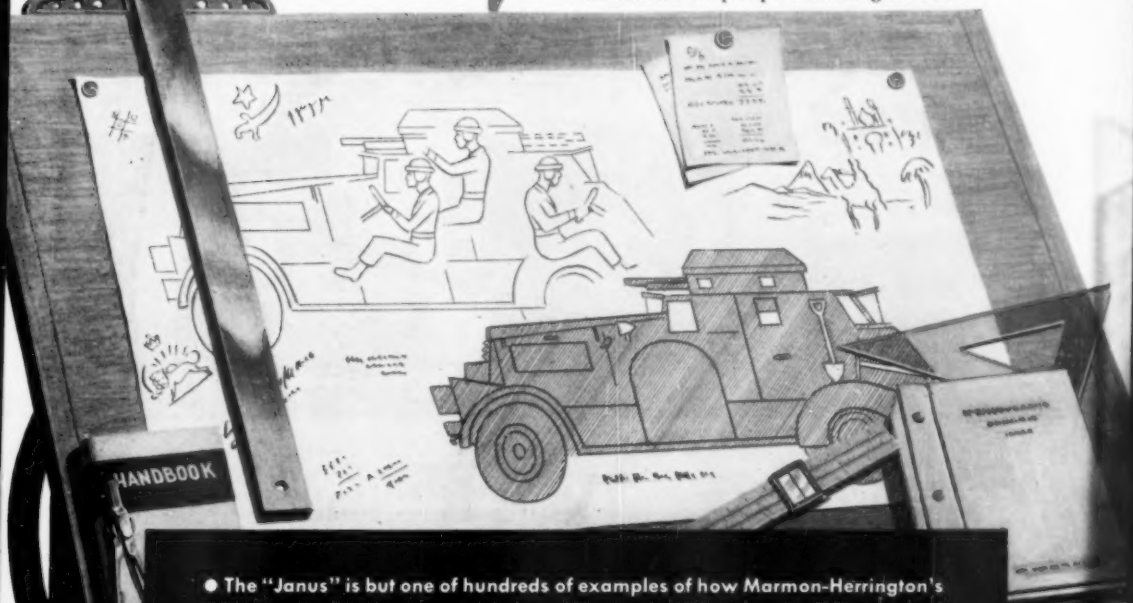
AMF does it better—automatically!

CREATORS AND PRODUCERS OF ELECTRONIC AND MECHANICAL EQUIPMENT FOR THE ARMED SERVICES: Radar antennae and drive units • automatic loaders for Army and Navy weapons • elevating and azimuth mechanisms • cooling fans for Army tanks • airplane parts • mobile ovens • electronic training devices • naval ordnance • rolled and welded steel products • shell components • silver-zinc batteries • special military projects

IMAGINATION IN ACTION!

the "Janus"

Two decades ago, Marmon-Herrington designed and built a large fleet of Janus-faced armored cars for the Iranian army. With two front ends, and no rear, these unique vehicles traveled with equal speed and ease in either direction—thus licking the problem of roads too narrow and steep to permit turning around.



● The "Janus" is but one of hundreds of examples of how Marmon-Herrington's engineering ingenuity has successfully solved some of the most vexing problems of military transport. No matter how difficult your own requirements may seem, if mechanization is involved, the chances are strong that Marmon-Herrington can help you find the right answer. Let's talk it over.

MARMON-HERRINGTON COMPANY, INC. • INDIANAPOLIS 7, INDIANA

MARMON-HERRINGTON

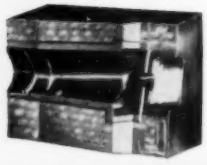
Military Mechanization is our specialty

For Jet Blades and for YOU...

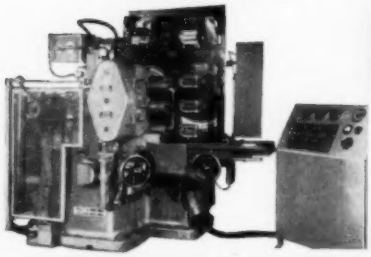
PRATT & WHITNEY

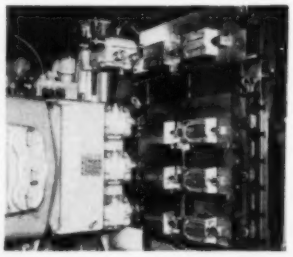
HERE IS THE COMPLETE [illegible] METHOD FOR MASS-

JET BLADE FORGING DIES

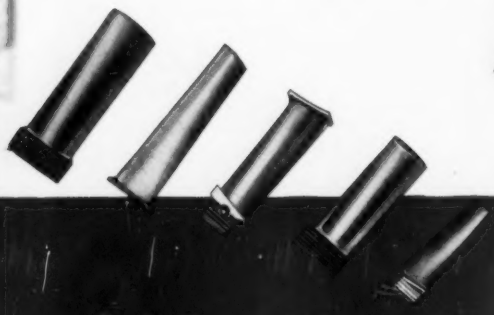


1 **ROUGHING DIE BLOCKS with the PRATT & WHITNEY-KELLER MACHINE** This P&W, Type BL-3620, 3-Spindle Keller Machine is performing the roughing operation on three male die halves at once; the female halves are similarly handled. Average machining time is only about 30 minutes per die half.

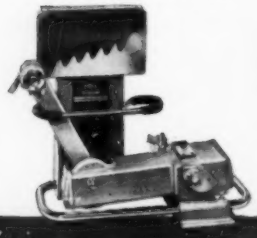


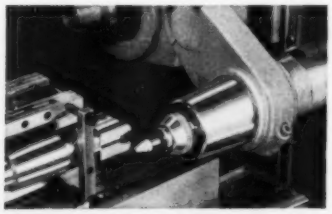


FINISHING JET BLADES



1 **FINISHING THE FIR TREE FORM on ROOT SECTIONS or BLADE CARRIERS with wheels formed on the PRATT & WHITNEY DIAFORM Wheel Forming Attachment** The fir tree form for this blade carrier is being ground with a wheel that was accurately formed to "tenths" in a few minutes with a Pratt & Whitney Diaform Wheel Forming Attachment. Grinding wheels for root sections are formed with equal speed and accuracy.





It's Logical to Look to

PRATT & WHITNEY

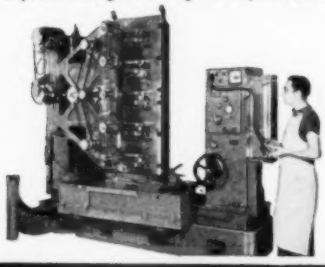
This example illustrates how a part of the diversified Pratt & Whitney Machine Tool line — backed up by P&W Gage and Cutting Tool Engineering Service — can break a critical production bottleneck. The jet blade production method shown here has been described by manufacturers using it as, "... by far the most accurate." What P&W has done for jet blade production it can do for your tough manufacturing problems.

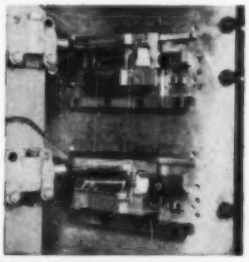
If you would like complete information about any of the equipment shown here — or if we can help you to solve a specific problem — write on your Company letterhead to the Pratt & Whitney Branch Office nearest you, or direct to West Hartford.

MEANS RESULTS

PRODUCING AND FINISHING TURBINE BLADE AIRFOILS

2 **FINISHING DIE BLOCKS TO ± .002 INCHES with the PRATT & WHITNEY AUTOMATIC DUPLICATING MACHINE** The 4-Spindle Pratt & Whitney Automatic Duplicating Machine is finish machining a set of four female die halves for a deeply curved turbine bucket. Hand polishing is needed only to remove mill marks; no hand correction of airfoil shape is required. Average machining time is just over 30 minutes per die half.





3 **CORRECTING DIES AFTER HARDENING**

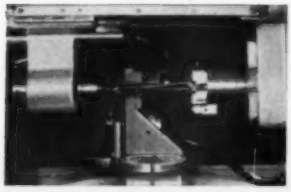
Dies are often unavoidably distorted in hardening to the usual Rockwell "C" 60-63. Since P&W Kellerflex Carbide Burs are used in this machine, these dies can easily be replaced in the P&W Automatic Duplicator and re-cut if necessary.

2 **GAGING FIR TREE FORMS with the PRATT & WHITNEY AIR-O-LIMIT GAGE**

Checking fir tree forms for pitch diameter with this P&W Air-O-Limit Gage is far faster and more reliable than the previous method of checking over wires with a hand micrometer. Air-O-Limit Gaging is available for both blade and carrier forms.

3 **FINISH GRINDING AIRFOIL SECTIONS TO ± .003 INCHES PRATT & WHITNEY TURBINE BLADE AIRFOIL GRINDER**

The *entire* twisted and irregular airfoil section of this blade—including leading and trailing edges—is being ground in a single automatic operation on a P&W Airfoil Grinder. A fine finish with closely maintained tolerances is produced.



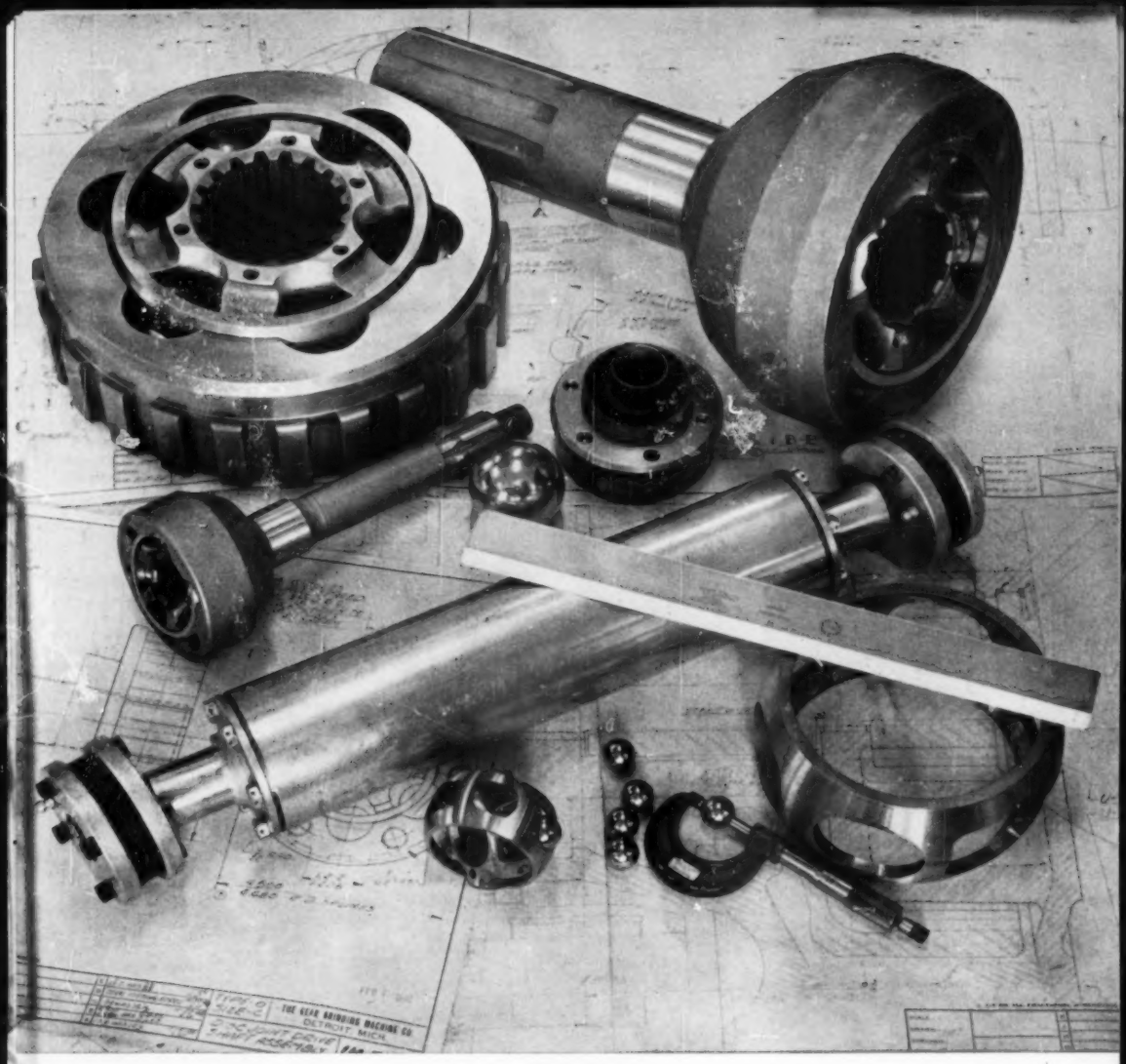
PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

WEST HARTFORD 1, CONNECTICUT, U. S. A.

First Choice P&W *for Accuracy*

MACHINE TOOLS • CUTTING TOOLS • GAGES



RZEPPA UNIVERSAL JOINTS

SIMPLICITY • RIGIDITY • CONSTANT VELOCITY • PRECISION • EFFICIENCY

On the land On the sea In the air

Choice of:

SIZES		FRONT DRIVES
ANGLES	*for*	ARTICULATED AXLES
SPEEDS		PROPELLER SHAFTS
TYPES		COUPLINGS
STYLES		SPECIAL DESIGNS

THE GEAR GRINDING MACHINE CO., ***Detroit 11, Michigan***

FRUEHAUF PRODUCTION VERSATILITY

Goes to work on MANY sub-contracts!

MOBILE OXYGEN-NITROGEN GENERATOR — Trailer built by Fruehauf ready for mounting of oxygen generating equipment by Air Products, Inc., Allentown, Pa. Units in service for U.S. Air Force overseas.

FRUEHAUF'S PRODUCTION VERSATILITY in sub-contract work on military vehicles is well illustrated by this Mobile Oxygen-Nitrogen Generator. The generating plant mounted by Air Products in this type of unit produces up to 1000 cubic feet of oxygen per hour, can be used by the Air Force anywhere in the world to produce oxygen for medical purposes or high altitude flying.

Fruehauf Sub-Contracts Widely Varied

During World War II Fruehauf supplied similar chassis to many other prime contractors for mounting of their specialized equipment for military use. This equipment included air compressors, electric generators, portable air conditioners, etc. Altogether, Fruehauf plants produced 101 different military vehicles during the war, and Fruehauf engineers assisted in the design of 126 military units, for both prime and sub-contracts.

An Experienced, Dependable Source

This wide experience, plus Fruehauf's long and successful record in building civilian Trailer equipment of all kinds, adds up to a tremendous capability, both engineering-wise and production-wise, within the Fruehauf organization. Fruehauf's seven American manufacturing plants comprise the world's most extensive facilities for the precision-production of Trailer vehicles. These vast facilities and Fruehauf's engineering background are always at the disposal of industry for sub-contract work on defense jobs of every size.

TRAILER EQUIPMENT

FOR EVERY CIVILIAN AND DEFENSE HAULING NEED!

GASOLINE TRANSPORTS— U. S. NAVY

1½-TON WATER TANK TRAILER

HEAVY DUTY PLATFORMS

1½-TON MILITARY CARGO TRAILER

POWDER HAUL VANS — 4 TYPES

World's Largest Builders of Truck-Trailers

FRUEHAUF TRAILER COMPANY

DETROIT 32, MICHIGAN

FRUEHAUF Trailers

"ENGINEERED TRANSPORTATION"

Searching

for more effective automatic control instruments?

Ketay's knowledge and experience will be helpful.

It was gained in developing and designing dozens of the precision control instruments that are today's military standards.

Take Ketay's Size 23 Synchro, for instance. This single development is an integral component in the controlling of the Skysweeper . . . the Army's latest automatic antiaircraft gun. Ketay's mass production techniques are making such controls economically practical.

Our instrument engineers, with more than 25 years of specialization in this field, could well put an end to your search for more effective automatic controls. There's no obligation, of course. Why not write for more information to Dept. J.

• NEWEST KETAY PRODUCT

SUBMINIATURE TYPE
1O1A2D SYNCHRO
CONTROL TRANSFORMER

Ketay Part No.	D—14450
Voltage rating	11.8v/0.4 v per deg.
Operating frequency	400 cps
Input power	0.4 w max.
Input current	140 ma max.
Input impedance	61 /77° ohms
Secondary voltage	23.2 ± 1 v
Total null voltage	40 mv max.
Fundamental Component of Null voltage	30 mv max.
Time Phase Shift	7°
Moment of Inertia	8.8×10^{-5} slug in^2
Frictional Torque	.05 oz. in.
Electrical Accuracy	—max. 10'

WHEN USED AS A
CONTROL TRANSMITTER

Voltage rating	26/11.8 v.a.c.
Input power	0.4 w max.
Input current	65 ma max.
Input impedance	475 /77° ohms
Output voltage	11.8 v ± 0.3 v
Time phase shift	7.3°

Ketay MANUFACTURING CORP.
New York, N.Y. Hawthorne, Calif.
Executive Offices: 555 Broadway, New York 12, N. Y.

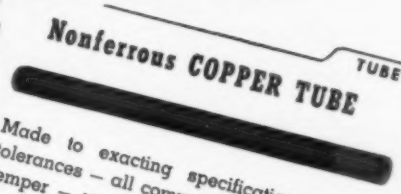
DESIGN
DEVELOPMENT
MANUFACTURE *of precision instruments*

• SYNCHROS • SERVOS • RESOLVERS
• MAGNETIC AMPLIFIERS • AUTOMATIC CONTROL SYSTEMS
• ELECTRONIC EQUIPMENT

LOOK TO WOLVERINE

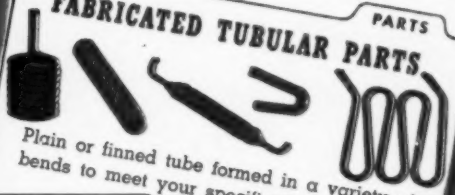
for
TOP QUALITY TUBE
and
FABRICATED TUBULAR PARTS

Nonferrous COPPER TUBE — TUBE



Made to exacting specifications — close tolerances — all commercial sizes — desired temper — variety of copper base alloys.

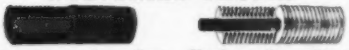
FABRICATED TUBULAR PARTS — PARTS



Plain or finned tube formed in a variety of bends to meet your specifications.

FINNED TUBE

WOLVERINE TRUFIN*



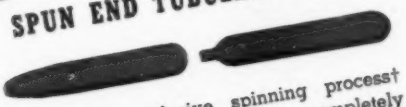
Copper and copper base alloys — Aluminum fins with copper base alloy liner

The integral finned tube in copper base alloy, all aluminum fins with copper alloy liner, or steel. Range of sizes, fin spacings and heights.

*REG. U.S. PAT. OFF.

TUBING

SPUN END TUBULAR PARTS



Wolverine's exclusive spinning process† used to form ends of tube — completely or partially closed-in variety of contours.

†A PATENTED PROCESS RE 22405

TUBE

ELECTRIC WELDED STEEL TUBE

TUBE.

CONDENSER TUBE

TUBING
Copper • Brass • Aluminum • Steel

If you seek information about unusual applications of any tubing, or if you want to know how tubing can be fabricated most economically into any form that will serve as a tubular part to become a component of another product, you'll find just the assistance you need by referring your problem to our Customer Engineering Service.

We can supply tubing for wide variety of applications

- Refrigeration
- Condensers
- Heat Exchangers
- Oil, water and gasolines
- Airplanes
- Manufacturing requirements

Wolverine Trufin and the Wolverine Spun End Process available in Canada through the Unifin Tube Co., London, Ontario.

Full information regarding these top quality products will be sent you promptly upon request.

When you attend the Inform-A-Show at Los Angeles, May 24-27, be sure to visit our Booth 304.

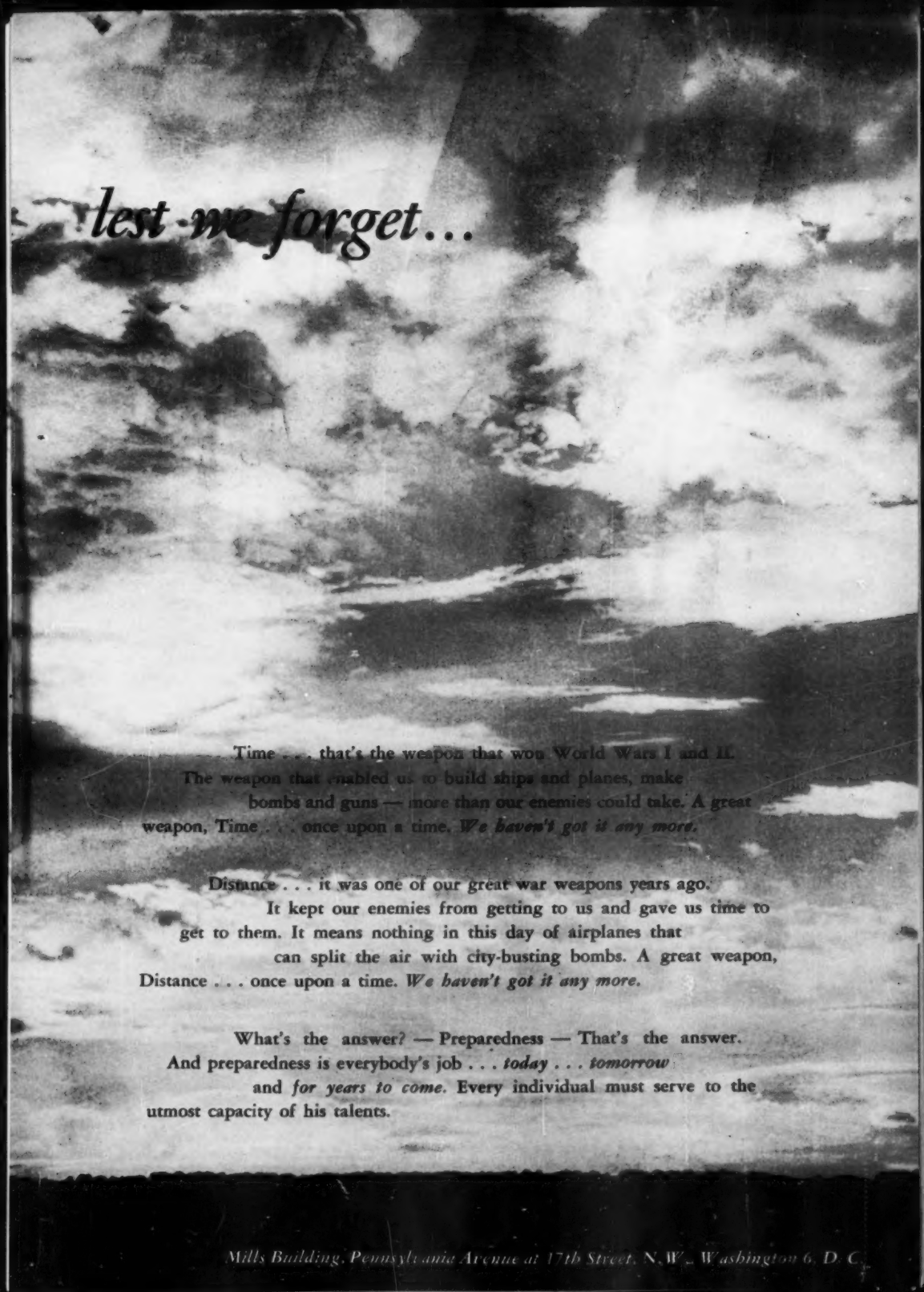
WOLVERINE TUBE DIVISION
of CALUMET & HECLA, INC.

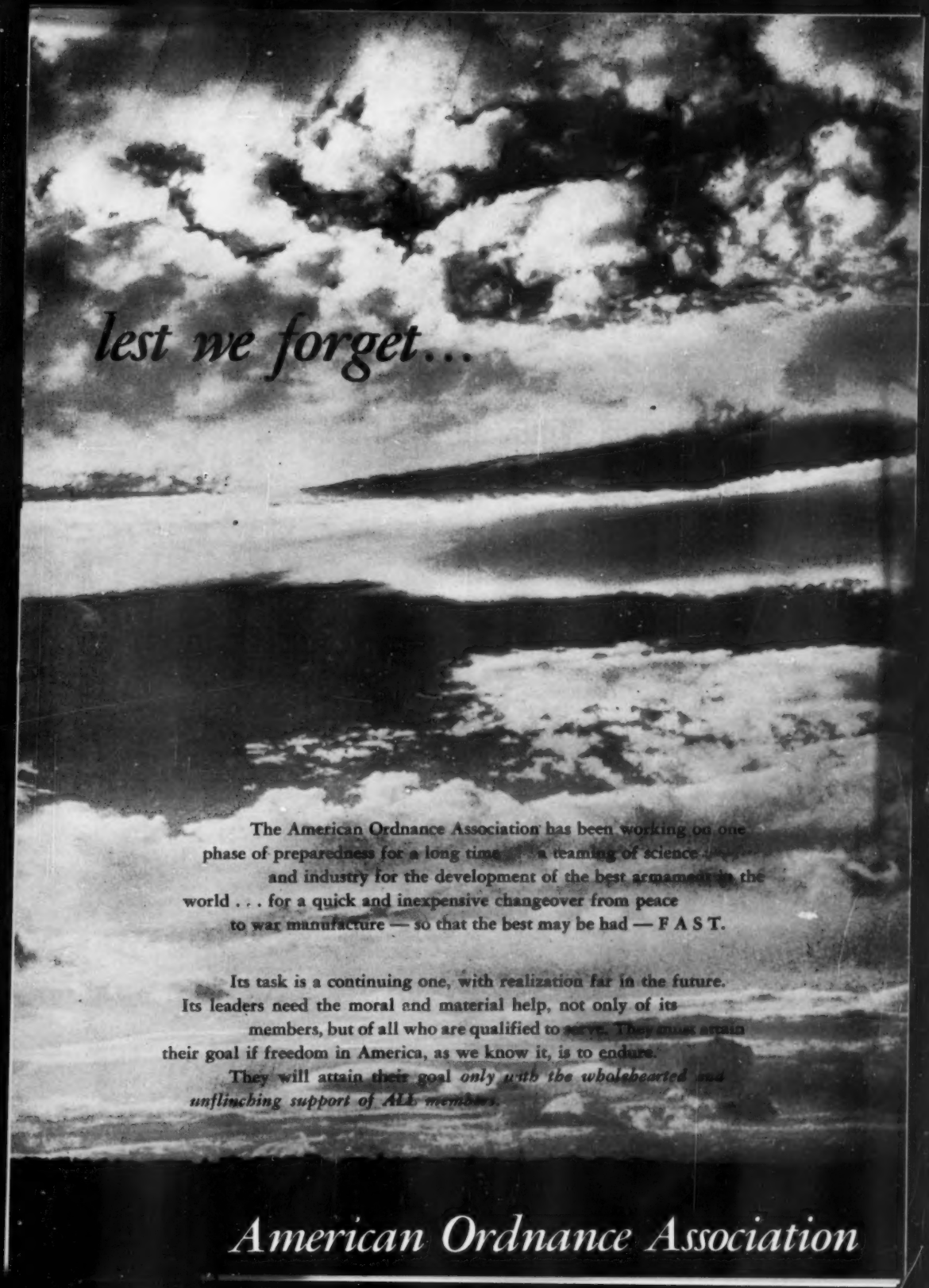
ESTABLISHED 1916

Manufacturers of Tubing Exclusively

1467 CENTRAL AVENUE • DETROIT 9, MICHIGAN

Plants in Detroit, Mich. & Decatur, Ala. *Sales offices in Principal Cities*


lest we forget...
Time . . . that's the weapon that won World Wars I and II. The weapon that enabled us to build ships and planes, make bombs and guns — more than our enemies could take. A great weapon, Time . . . once upon a time. We haven't got it any more.
Distance . . . it was one of our great war weapons years ago. It kept our enemies from getting to us and gave us time to get to them. It means nothing in this day of airplanes that can split the air with city-busting bombs. A great weapon, Distance . . . once upon a time. We haven't got it any more.
What's the answer? — Preparedness — That's the answer. And preparedness is everybody's job . . . today . . . tomorrow and for years to come. Every individual must serve to the utmost capacity of his talents.
Mills Building, Pennsylvania Avenue at 17th Street, N.W., Washington 6, D. C.


lest we forget...
The American Ordnance Association has been working on one phase of preparedness for a long time . . . a teaming of science and industry for the development of the best armament in the world . . . for a quick and inexpensive changeover from peace to war manufacture — so that the best may be had — F A S T.
Its task is a continuing one, with realization far in the future. Its leaders need the moral and material help, not only of its members, but of all who are qualified to serve. They must attain their goal if freedom in America, as we know it, is to endure.
They will attain their goal *only with the wholehearted and unflinching support of ALL members.*
American Ordnance Association

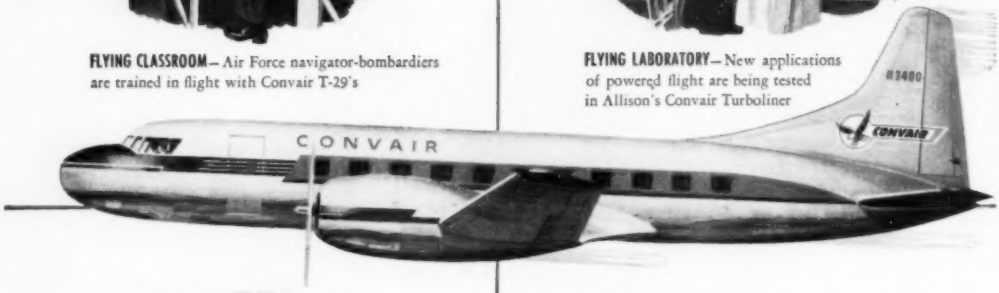
FLYING OFFICE—Top companies keep pace with modern business in Executive model Convairs

FLYING HOSPITAL—Convair's flying Samaritan speeds medical care and comfort for the armed forces

—Convair gives wings to people on the *GO*—

FLYING CLASSROOM—Air Force navigator-bombardiers are trained in flight with Convair T-29's

FLYING LABORATORY—New applications of powered flight are being tested in Allison's Convair Turboliner



FLYING... for business or pleasure on your favorite airline is always popular in a Convair

CONVAIR'S VERSATILITY has made it the most universally accepted aircraft in modern aviation. More airlines have chosen the Convair than any other post-war passenger plane. Business corporations and the armed forces are using Convair fleets to give wings to vital services. Watch for new versions and even greater utility of the Convair ... achieved through engineering that aims at the maximum ... Engineering to the *Nth* Power!

CONVAIR

San Diego & Pomona, Calif.– Ft. Worth & Daingerfield, Texas

For ORDNANCE CLEANING WHEELABRATOR® gets the OK

OK for PRODUCTION SPEED

Wheelabrator airless blast cleaning is so fast that endless manhours are saved. One Wheelabrator often cleans a quantity of parts in 5 to 15 minutes that take hours by less efficient methods. It speeds production and reduces cleaning costs to a minimum.

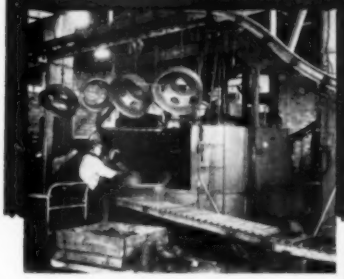
OK for CLEANING QUALITY

Wheelabrator cleaning is so thorough, it quickly receives the stamp of approval in applications having the most exacting requirements. Its high speed abrasive blast scours away all traces of sand and scale right down to the virgin metal.

OK for FACILITATING INSPECTION

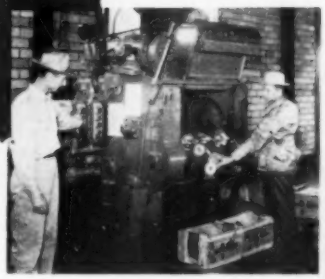
Ordnance parts are so thoroughly cleaned by Wheelabrating that rejects, due to improper cleaning, are eliminated. Surface defects are clearly revealed to provide simplified and more accurate inspection.

And there's a WHEELABRATOR machine for every ordnance application



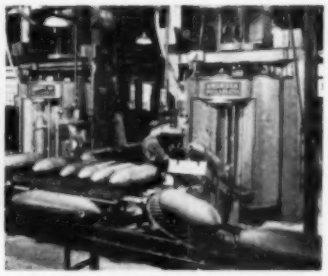
WHEELABRATOR TABLES

A 50% saving was effected in the cost of removing rust and scale from heavy mobile equipment components by this Wheelabrator Multi-Table. Wheelabrator tables are available with a single work table, a number of independent work tables, or with an exclusive "Swing Table" design.



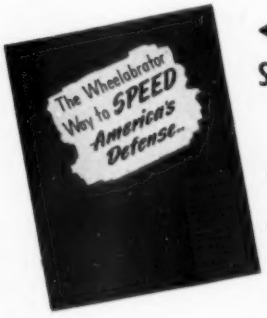
WHEELABRATOR TUMBLASTS

This Wheelabrator Tumblast does the work of five men in preparing small arms components for bonderizing. Tumblasts are extensively used for the low-cost speed cleaning of a wide variety of pieces sufficiently rugged to withstand a gentle tumbling action. Available in eight standard sizes.



WHEELABRATOR SHELL MACHINES

These two Wheelabrator machines each clean seventy-five 500-lb. bombs hourly setting a new production record in an Indiana plant. Wheelabrator Shell machines are especially designed for cleaning the complete range of sizes of shells and bombs on a production line basis.



SEND for this IMPORTANT BULLETIN

The advantages of Wheelabrator cleaning for "Speeding America's Defense" are described in Bulletin No. 794. Send for a copy of this bulletin today.

American
WHEELABRATOR & EQUIPMENT CORP.
888 S. Byrkit St., Mishawaka, Indiana

Wheelabrator®
AIRLESS BLAST CLEANING

Another Example of Beaird Manufacturing Skill

PACKAGED LP-GAS FILLING STATION

The use of clean burning LP-Gas as a motor fuel is growing rapidly among operators of truck and taxi fleets, bus lines and heavy construction equipment. To service these vehicles and equipment, Beaird has developed a completely packaged LP-Gas filling station. This station, recently put on the market, includes all necessary components and is delivered fully assembled, ready for immediate operation.

THIRTY-FIVE YEARS EXPERIENCE in manufacturing a wide variety of products have made Beaird unusually well equipped to handle large production orders of ordnance materials.

Central location near Southwest ports
Ample supply of Skilled labor
Modern manufacturing facilities
Experienced engineering staff
Trained inspection department
Strong financial position

SINCE 1918
BEAIRD
SHREVEPORT
MACHINING FABRICATING STEEL WAREHOUSE

THE J. B. BEAIRD COMPANY, INC. Shreveport, Louisiana

PACKAGED COMPRESSOR PLANTS | LP GAS SYSTEMS | CAST STEEL FITTINGS | ANHYDROUS AMMONIA EQUIPMENT | PRESSURE BULK STORAGE

Remington Rand Methods News

Three ways to untangle snarls in your production scheduling

Take the case of a plant where snarls developed about a year after it had been modernized. Suddenly orders backed up in the shop. Some machines had a big backlog while others were idle. Production control methods were out of mesh somewhere. But where? The production men were stymied when it came to overhauling the record-keeping methods.

Plant officials decided to call in Remington Rand for professional counsel. A preliminary study showed the problem went much further than machine-load scheduling. So our management engineers were authorized to dig deeper.

In their final report, these engineers proposed simple answers to each problem uncovered – all coordinated into a revised control system that soon eliminated snarls in machine loading. In fact, within three years this system was processing a doubled plant output with same smooth-working efficiency.

Let us give you the full case history of this plant's experience with *an outside viewpoint* to help simplify control methods. Ask for folder **CH-724.**

Or take the case of the big production snarl caused by a small part – because it is the wrong part. Poor description of parts causes all kinds of plant headaches: assembly delays, duplicate stocks, high paperwork costs.

But the remedy is simple and sure: identify and classify each item properly, so it can always be referred to by exact number. Recoding your parts and materials may cost less than you expect. Our engineers have built up a special library of standard nomenclature and numbering systems which can be readily adapted to your coding problems. For details, see **BSD-10.**

Another case is the production snarl caused by out-of-date control figures. When your clerks are not able to keep all records current, it's time for you to look into new ways of producing the figures. Many firms use our punched-card record services to get figures faster, at lower cost, for materials control, machine loading, costing, etc. See **BSD-6.**

GET A PRIVATE SHOWING OF NEW SOUND SLIDEFILM ON PRODUCTION CONTROL

It will be 23 minutes well spent for your key executives who get to see this brand new film on efficient coordination of men, machines and materials. Shows you practical methods for speeding a new schedule into actual production, holding down the materials inventory, spotting the bottlenecks before they happen, and adjusting a schedule to new conditions. Check coupon below for showing at your convenience.

RECORDS LOST. Here the loss of $40,000 in plant and equipment was covered by insurance. But the uninsured records of all orders in production were also destroyed. The firm paid heavily in both time and money to reconstruct these records. Such a fire always comes when least expected. The loss in records often exceeds the building losses. What would happen to *your* in-process papers?

RECORDS FOUND. Here, on the morning after a five-hour plant fire, all vital operating records were found intact. Though other files were completely destroyed, these papers survived in perfect condition. Remington Rand Safe-Files provided insulated protection *at the point of use!* This certified protection is also available in Safe-Desks and Safe-Cabinets. See actual case history RG-552.

Visible tool records cut production costs in this plant by accurate control of tool charge-outs and reordering points.

A new tool crib system won't cost you a penny!

A rush request comes in for a tool. If the tool is not there, work must be rescheduled. That's when you need tool-crib control that really works.

In plant after plant, a small investment for a 100% system has shown a big profit in: 1) assured availability of tools to meet production schedule needs; 2) numerous tangible savings on tool inventory, purchasing, repair, and losses; 3) reduced tool crib personnel.

Yes, it's actually easier, takes less work, to maintain *complete* control over tools than to rely on outmoded or make-shift routines. A Remington Rand tool crib system keeps paperwork at an absolute minimum . . . simplifies filing and finding of records by tool and by worker . . . gives your tool supply status in a *visible* picture by item.

It will pay you to study tool control forms and procedures now used in hundreds of plants, easily adaptable to your special plant needs. Ask for methods folder **KD-641.**

Management Controls Reference Library
Room 1961, 315 Fourth Ave., New York 10

Please circle the literature you desire:

CH-724 BSD-10 BSD-6

☐ Production control film showing

RG-552 KD-641

Name_____

Title_____

Firm_____

Address_____

City_____

Remington Rand INC

Operators of the Louisiana Ordnance Plant

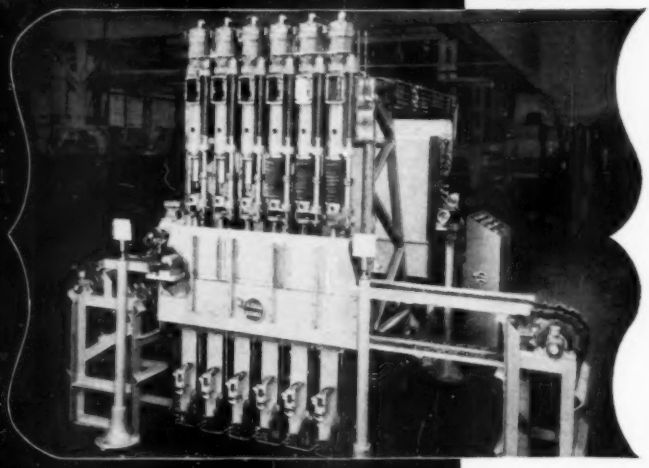
p.11

Cavity Facing and Shell Banding Equipment By

W. F. & JOHN BARNES

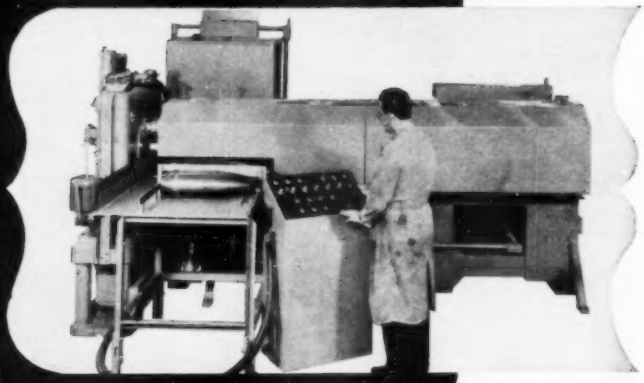
Over 1000 105 MM Explosive Shell Charges Faced Per Hour

Now face or drill cast or consolidated explosive shell charges fast, accurately and with full remote control safety. This Barnes Machine can be furnished to accommodate shells from 57 MM to 8" including 2.36, 3.5, 4.5 rockets and 81 MM and 4.2 mortars. Fully interlocked mechanisms eliminate operators from the hazardous area. Illustrated is a 6-spindle model; 2 and 4 spindle machines are also available.



Band Over 300 105 MM Shells Per Hour

The machine illustrated will receive the shell and the band, transfer them to the multiple jaw banding head, band in a single squeeze motion and eject the banded shell in a completely automatic cycle. A minimum of work hardening of the rotating band is a direct result of this single squeeze banding method. This machine will band either live or inert ammunition. Auxiliary equipment for the banding operations includes machines for band resizing, band deburring, band size checking and debanding. Infeed and take away conveyors, custom designed to suit your plant, can be furnished as a package with the Banding Machine.



Other BARNES Ordnance Equipment

In addition to these machines, the Barnes Company has designed and manufactured machines in the following categories:

a) Zone storage units,
b) Zone weigh handling mechanisms,
c) Fuze tensioning machines,
d) Custom handling devices for all phases of Ordnance work.

Complete electrical, hydraulic and mechanical facilities are available to coordinate these mechanisms into a smooth processing operation.

Free Additional Literature

is available on all Barnes Ordnance equipment. Since it is impossible to give the complete scope of operation in this restricted space, we invite you to write for the complete Barnes Ordnance book. Ask for bulletins O-553.

W. F. & JOHN BARNES

W. F. and JOHN BARNES

PROCESS EQUIPMENT DIVISION 388 SOUTH WATER STREET, ROCKFORD, ILLINOIS

Suppose we put the Dempster-Dumpster System right down in your plant . . . then what?

● *Well First—let's make it clear that we are furnishing you with several sizes of different designs of 26 containers to suit your materials requirements. Then bear in mind that we are delivering you only one truck-mounted Dempster-Dumpster and with your driver this one outfit picks-up, hauls and dumps all containers, about like the one shown above.*

Now, how many conventional trucks are you using for handling rubbish, scrap, raw materials, and what have you?

For several years now, one plant has been doing considerably more work with two Dempster-Dumpsters and two men than they did with five trucks and fifteen men before the Dempster-Dumpster System was installed. You can guess at the approximate savings annually.

A glance at the picture below and you get the whole story of the Dempster-Dumpster System. Never before have you been able to cut bulk materials handling costs so drastically.

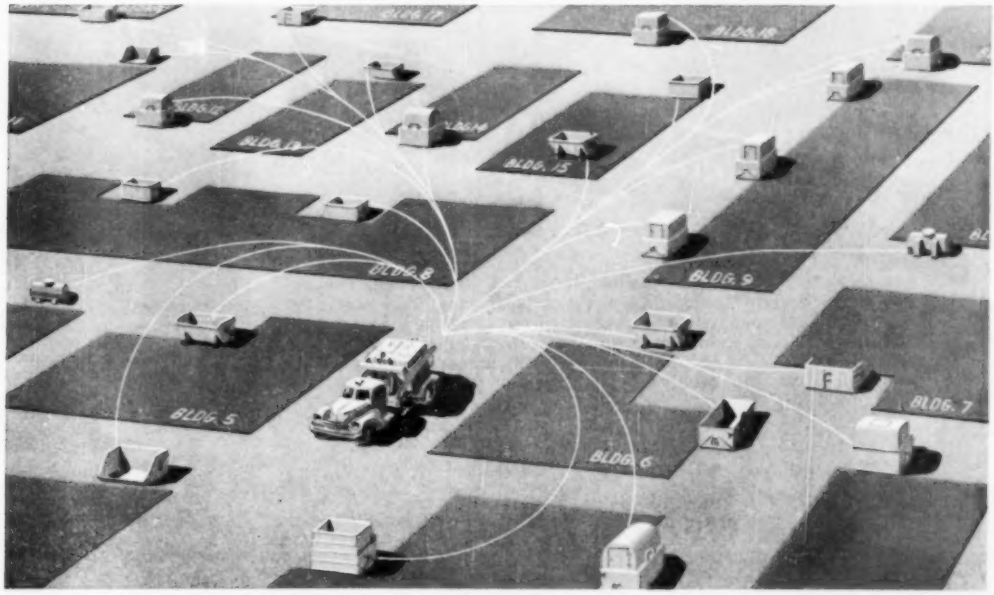
One truck mounted Dempster-Dumpster handles the entire group of 26 Dempster-Dumpster containers. These big, detachable steel containers are like having 26 truck bodies for a single truck.

Any required number of Dempster-Dumpster containers are spotted at convenient materials accumulation points inside and outside your buildings. They range in sizes up to 12 cu. yds.—3 to 4 times the capacity of a regular dump truck. Materials—bulky, light, heavy, solids, rubbish and even liquids—are dumped or placed into these containers.

The truck mounted Dempster-Dumpster makes scheduled rounds, picks up each preloaded container, carries it to the point of disposal, sets it down intact or dumps the materials and returns the container for refilling. The entire operation is hydraulically controlled and handled by your truck driver.

It's as simple as we have described it. The amazing thing is the tremendous savings being made by the Dempster-Dumpster System in hundreds of leading industrial plants over the nation.

A product of Dempster Brothers, Inc.



DEMPSTER BROTHERS, 953 Shea Building, Knoxville 17, Tennessee

"Buffalo" **BUILDS the DRILL that can cut your**

- **REJECTS**
- **WASTE MOTION**
- **FATIGUE**

. . . IN THE TOOL ROOM . . . OR "ON THE LINE"

You can pick a "Buffalo" Drill matched to the exact drilling, tapping or reaming jobs you do, and get a real saving in time and costs. At left is one example—the "Buffalo" No. 14 High Speed Sensitive Drill for accurate work on precision parts using drills up to ½".

Seven other models, up to 2" capacity in cast iron, are available. All controls are placed for almost effortless operation. Speed changes and table or head raising or lowering are all done rapidly.

For JOB DRILLING or "MARATHON" RUNS

Whether you need a machine for odd-job drilling, tool room work or long production runs, "Buffalo" builds it. At right is the famous "RPMster", the drill with 1001 speeds instantly changed. At left is the big, rugged "22" that's as easy to handle as small sensitive drills. As a first step towards getting *your* drilling costs down, why not write us for recommendations on your problem? Thousands of plants have benefited by doing this.

"Buffalo" MACHINE TOOLS

BUFFALO FORGE COMPANY

534 BROADWAY BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

DRILLING PUNCHING SHEARING CUTTING BENDING

GOVERNMENT FINISH SPECIFICATIONS

and the Parker Products which meet them

This list contains specifications most frequently called for, and some of the Parker Products which meet them. There are Parker Products to meet almost every one of the less frequently used government specifications also. A letter or telephone call to Parker, Detroit, will secure specific information on products to meet government specifications not listed here.

SPECIFICATION	PARKER PRODUCTS
JAN-C-490 (Replaces AXS-1245)	
Grade I	Bonderite 100, 160, 170, 180
Grade II	
Type 2	Parco Cleaners 341, 350, 371
Type 4	Parco Cleaners 250, 260
Type 5	Parco Cleaners 210, 220
Type 6	Parco Cleaners 100, 101, 110
MIL-10578 (Formerly U.S.A. 3-213)	
Type I (Wash-off)	Parco Cleaner 250
Type II (Wipe-off)	Parco Cleaner 260
MIL-C-5541 (Formerly AN-C-170)	Bonderite 710 (chemical film for aluminum and its alloys)
MIL-C-16232 (BuORD)	
Type I	Parco Lubrite 1 & 2
Type II	Parco Compound
PA-PD-191	
Grade I	Bonderite 32, 34, 100, 160, 170, 180
Grade II	
Type 2	Parco Cleaners 341, 350, 371
Type 4	Parco Cleaners 250, 260
Type 5	Parco Cleaners 210, 220
Type 6	Parco Cleaners 100, 101, 110
U.S.A. 72-53	Bonderite 32, 34, 100, 160, 170, 180
U.S.A. 57-0-2	
Type II	
Class A & A1	Parco Lubrite 1 & 2
Class B	Parco Powder—Parco Compound
Class C	Bonderite 100, 160, 170, 180

For information regarding these or other specifications, write

PARKER

RUST PROOF COMPANY

2165 E. Milwaukee Ave., Detroit 11, Mich.

FIRST IN THE FIELD SINCE 1915

WHAT HAPPENED

FASTAX High-speed Motion Pictures SHOW YOU!

With a great roar this guided missile should rip skyward at 3,500 miles an hour. What happened just before it took off? Only FASTAX—the world's highest-speed motion picture camera—can accurately tell. FASTAX slows action down with its speed range from 150 to 16,000 pictures a second.

In industry FASTAX is rendering the same service by turning the blur of speed into clear pictures for visual analysis. Viewed on the screen, action is slowed down as much as 700 times. Engineers see the cause of excessive wear, vibration, noise or early failure. The result—better design, longer performance.

SEE WOLLENSAK for complete high-speed equipment . . . cameras, lenses, lights, control equipment, exposure meters, film and other aids for better picture making.

WATCH WOLLENSAK for new developments in high-speed photography.

Let us help you solve your problems. WRITE to Industrial & Technical Photographic Division.

Wollensak OPTICAL COMPANY

ROCHESTER 21, N.Y.

Why Electron Tube Buyers do business with Tung-Sol®

Tung-Sol's modern manufacturing techniques and advanced quality control methods assure you of a product that is second to none. Tung-Sol makes tubes—no sets—no equipment—just tubes. Tung-Sol design, development and application engineers work closely together for the sole purpose of producing a better tube so that you can make a better product. Engineering assistance is strictly confidential. Tung-Sol service by competent field sales representatives is nationwide. A Tung-Sol delivery promise is a promise. Closest cooperation is maintained to keep deliveries up to your production schedule requirements.

TUNG-SOL ELECTRIC INC.
Newark 4, N. J.

Sales Offices: Atlanta, Chicago, Culver City (Los Angeles), Dallas, Denver, Detroit, Newark, Seattle

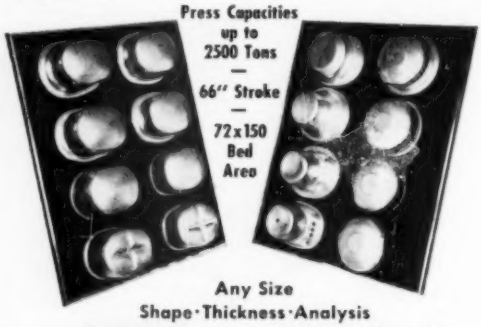
TUNG-SOL MAKES All-Glass Sealed Beam Lamps, Miniature-Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes.

HOUSINGS!

DEEP DRAWN METAL STAMPINGS

for hermetically sealed compressor units

Below is shown an assortment of domes varying in size, shape, and metal thickness. Whatever your housing requirement may be, check Leake's volume production facilities for the manufacture of these components.



Any Size
Shape · Thickness · Analysis
Literature available · WRITE

Look to LEAKE for *unusual* metal stampings

THE LEAKE STAMPING COMPANY
MONROE, MICHIGAN

"with GULF SUPER-QUENCH

Rockwell C-65 is a sure thing on SAE 52100 steel balls,"

says Mr. John Genishus, Plant Manager, Waterbury Steel Ball Co., Waterbury, Conn.

"In our experience, there's nothing like Gulf Super-Quench for quenching steel balls for anti-friction bearings," says Mr. Genishus. "These parts require a uniform as-quenched hardness of at least Rockwell C-65 all the way through. Then we temper to Rockwell C-62. Metallographic examinations show we're getting a fine grain structure with Gulf Super-Quench and one which is very homogeneous. We feel that a goodly share of our success in this operation can be attributed to this fast quenching oil."

No matter what alloy steels or shapes you quench, you will gain from the greater quenching power of Gulf Super-Quench. For further details on this outstanding quenching oil, contact your nearest Gulf office.

GULF SERVES INDUSTRY

Gulf Oil Corporation
Gulf Refining Company
Pittsburgh 30, Pa.

USE OLIN ARMAMENT RESEARCH FOR YOUR PRIME CONTRACT PROBLEMS

Olin is the home of a large staff of armament specialists whose efforts are devoted to the solving of problems like yours. At their disposal they have research, development and large-caliber testing facilities with the means and experience to put the final product into full scale production. For further information, write to us.

ARMAMENT RESEARCH DEPARTMENT

OLIN INDUSTRIES, Inc.

NEW HAVEN 4, CONN.

Olin

Divisions of Olin Industries, Inc.,
Arms and Ammunition • Ecusta Paper • Electrical
Explosives • Export • Forest Products
Metals • Olin Cellophane • Ramset

Why bore a hole when you can buy it?

SHELBY SEAMLESS STEEL TUBING

comes to you with the hole and basic shape already made!

IT costs money to bore a hole through solid stock. It takes time. It wears out tools. It wastes steel. In other words, it's poor economy.

By using Shelby Seamless Mechanical Tubing you can eliminate or greatly reduce many time and labor consuming operations connected with boring and machining.

Shelby Seamless Tubing is available in a complete range of sizes; in different wall thicknesses; various finishes and steel analyses . . . with the basic shape already made . . . and with the hole built in.

Another important advantage in using Shelby Tubing is that its excellent machining characteristics and uniformity speed up production and improve the quality of your output. You can turn out parts by the millions and the last part will be as metallurgically and dimensionally accurate as the first.

Why not talk to National's engineers about the economic advantages of using Shelby Seamless Tubing? You can be sure that any recommendations they make will be based on a thorough study of your particular requirements.

All Shelby Seamless Tubing is pierced from solid billets of uniform steel. This is the one manufacturing method that assures absolute uniform wall strength.

THIS FREE BOOK tells how you can cut production cost and make better parts. Write for it today.

NATIONAL TUBE DIVISION
UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
(Tubing Specialties)
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S SHELBY SEAMLESS MECHANICAL TUBING

USS

UNITED STATES STEEL

MILITARY

SPARE PARTS PACKAGING

FIBER CONTAINERS TO MEET GOVERNMENT SPECIFICATIONS MIL-C-5405 MIL-C-12147

If you require containers, cans or tubes . . . we are here to help you with fast service and fine workmanship. Call on us for certified containers for spare parts packaging under MIL-C-12147 and MIL-C-5405. Rigid inspection, prompt delivery to anywhere in the U. S.

Write, Wire or Phone Today!

UNITED CAN COMPANY, INC.

Plant & General Offices:
Box 42
Phillipsburg, N. J.
Tel.: Phillipsburg 5-1135

New York Sales Office:
34 Park Row
Tel.: Cortland 7-2949

So You Don't Have Mechanical Cleaning Equipment, Eh!

then...

WIPE-OFF Metalprep *is Your Answer!*

A MANUALLY APPLIED METAL CONDITIONING PRODUCT DESIGNED TO PERFORM THE FOLLOWING FUNCTIONS:

- **CLEANS THE METAL**
- **REMOVES THE RUST**
- **ETCHES THE METAL**

providing an anchor for your paint and a PHOSPHATE COATING for greater paint durability.

Also recommended for Spot Rust Removing after Mechanical Cleaning.

Send for Bulletin 50-34

EXCELLENT FOR LOW PRODUCTION AND BULKY EQUIPMENT

NEILSON CHEMICAL CO.

MANUFACTURERS OF METALPREP

2402 Tecumseh Road Windsor, Ontario | 6580 Benson St., Detroit 7, Mich. | 2411 Union Pacific Ave. Los Angeles 33, Calif.

WANTED

Sub-contracts for the fabrication of

DUCK COTTON NYLON

straps, carrying cases,
canvas covers, bags, kits.

We have had 5 years of experience in this type of manufacture, including work for military organizations. We have successfully performed on over one-half million dollars worth of contracts . . . primarily for the Ordnance Corps.

If your contract calls for any type of work requiring stitching, write, wire or call us:

THE EDLEN HERMAN COMPANY
2440 North Coral Street
Philadelphia 25, Penna.
REgent 9-8639

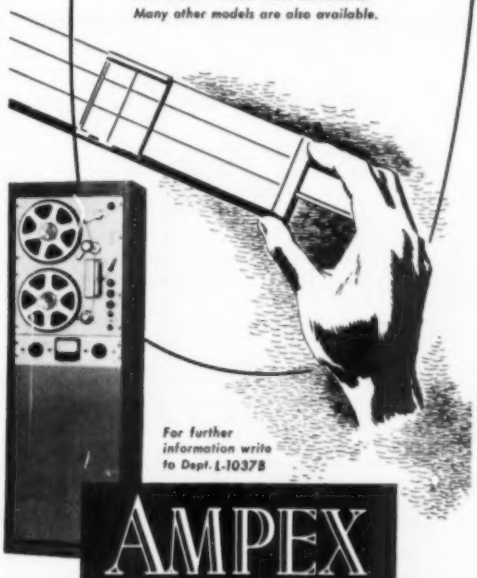
How to fly a guided missile in your laboratory...

Practically any electrical, mechanical or physical phenomenon — even the full flight of a guided missile — can be precisely re-created in the laboratory from Ampex magnetic tape recordings.

Ampex retains and plays back data in the same electrical form in which it is received, making its playback in effect equivalent to a rerun of the original test. But it has these added advantages: Data can be repeated at any time or place, can either be scanned or studied in whole or part, can be speeded up or slowed down, can be fed to automatic reduction systems. Furthermore, desired portions of the data can be reduced to oscillograph traces, pen recordings or any other form that could have been made at the time of the original test.

- *Ampex Tape Recorders, being rugged, compact and portable, are usable where other equipment would not be feasible;*
- *Ampex Tape Recorders cover extremely wide frequency range:*

Model 306 — 0 to 5000 cycles/sec.
Model 307 — 100 to 100,000 cycles/sec.
Model 303 — Pulse width modulation
Many other models are also available.



For further information write to Dept. L-1037B

AMPEX
MAGNETIC RECORDERS

AMPEX ELECTRIC CORPORATION
934 CHARTER STREET • REDWOOD CITY, CALIF.

WE BELIEVE THAT A STRONG AMERICA IS A PEACEFUL AMERICA

MASON & HANGER COMPANY
SILAS MASON COMPANY

ENGINEERS
and
CONTRACTORS

Builders and Operators of
Ordnance Facilities

OFFICES:

500 Fifth Avenue
New York

Shreveport
Louisiana

Lexington
Kentucky

Cork-and-Rubber Gasket Materials

Armstrong manufactures cork-and-rubber gasket materials made to meet each class of the principal government specifications covering cork-and-rubber gasket materials.

Specification	Material
MIL-G-6185	
Type I Soft	NC-709
Type I Medium	NC-710
Type I Firm	NC-711
MIL-T-6841	(DK-153 (RK-304S
Type II Soft	DC-167
Type II Medium	DC-100
Type II Firm	DC-113
MIL-G-6747	DK-149

Write for samples and 24-page gasket design manual.

ARMSTRONG CORK COMPANY
2905 Arch St., Lancaster, Pennsylvania

A PAID NEWS ADVERTISEMENT BY THE ALVEY-FERGUSON CO.

CONVEYING . . New concave roller conveyor, designed for cylindrical objects

No slipping — no sliding off

Shells and other cylindrical objects can be handled more efficiently by this new A-F Concave Roller Conveyor. It keeps objects in center of the conveyor line, prevents them from slipping to either side or sliding off as frequently happens when ordinary straight or flat type rollers are used. In most cases no guard rail is necessary, thus shells can be placed on or removed from the conveyor more quickly and easily than when they must be lifted over a guard rail.

Made of No. 10 gauge steel tubing, the new A-F Concave Roller Conveyor is available with a 7/16" shaft for ordinary work, or a 11/16" shaft for heavy duty work—available with plain, dust-tight or grease-seal ball bearings. Width of roller is 4⅝", for handling 3" shells and larger. The concave rollers can be furnished with Neoprene coverings, if desired, to prevent scratching and for complete protection of the objects moving along the line. Both straight and curved sections are available.

For latest information on modern, efficient handling methods for all types of products and materials, write

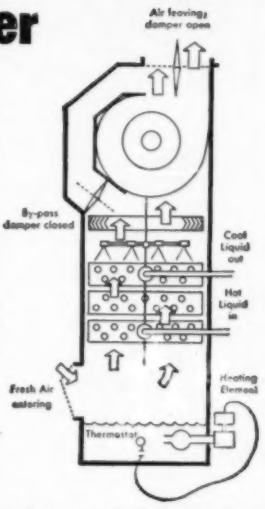
The Alvey-Ferguson Company
532 Disney St., Cincinnati 9, Ohio

NIAGARA Aero Heat Exchanger

1. Extends quenching capacity without extra water or cooling tower.
2. Quickly pulls down heat at initial peak load of Quenching.
3. "Balanced Wet Bulb" Control holds quench bath at proper temperature, heating if needed to start after shut-down, and cools or heats by automatic control.
4. Saves cleaning expense as compared to cooling tower which picks up acids and fumes from air.

APPLICATIONS

Quench Oils
Cutting Oils
Lubricating Oils
Cooling Water



For help in increasing production, saving of cooling water, write for Bulletin No. 120. Address

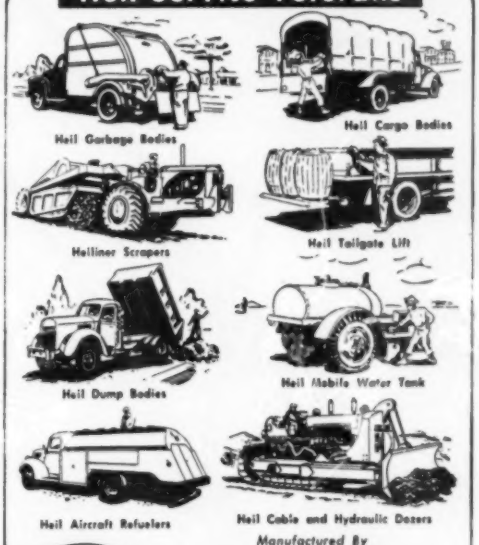
NIAGARA BLOWER COMPANY

Over 35 Years of Service in Industrial Air Engineering

Experienced District Engineers in Principal Cities of U. S. and Canada

Dept. O, 405 Lexington Ave. New York 17, N. Y.

Heil Service Veterans



Manufactured By

HEIL Quality Products

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

Send For Complete Catalog

ARE DRIVERS "RAILROADING" YOUR VEHICLES?

Handy Governors Will Stop It

Any driver is likely to be less than meticulous in his care of a vehicle he doesn't own. Many feel no compunction about "railroading" your vehicles. Drivers do most of their work away from supervision . . . abuses are hard to correct.

Handy Governor will stop "railroading"—stop practices which run up costs and wear out vehicles before their time.

The savings in tire, fuel, and lubricant costs, engine repairs, brake maintenance and general maintenance are spectacular. Reduced accident and insurance costs are equally important.

Let us show you some figures on savings—and tell you how little it costs to get them.

KING-SEELEY CORPORATION

ANN ARBOR, MICHIGAN

PLANTS AT ANN ARBOR, SCIO, YPSILANTI

For men who know firearms

2 new shotguns from Remington

These graceful new Remington shotguns are best appreciated by the man who really knows firearms. Both the pump action Model 870 "Wingmaster" and the autoloading "Sportsman-48" are streamlined beauties in polished walnut and fine steel.

But underneath all that, there's beauty in the simplicity of their functional design. For these new Remington shotguns have fewer working parts than ever before in Remington history . . . smooth, trouble-free action . . . lightness and natural feel that make them a delight to shoot—now and through the years.

Whether you prefer the autoloader or the pump action, you've a treat in store. See them at your Remington dealer's.

"If It's Remington—It's Right!"

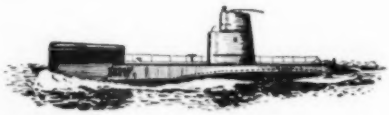
Remington DU PONT

"Wingmaster" and "Sportsman" are Reg. U. S. Pat. Off. by Remington Arms Company, Inc., Bridgeport 2, Conn.

For nearly a half century

Kollmorgen has developed, designed and manufactured the following equipment for the Armed Services.

SUBMARINE PERISCOPES
NAVIGATIONAL INSTRUMENTS
FIRE-CONTROL DEVICES



KOLLMORGEN Optical CORPORATION
PLANT: NORTHAMPTON, MASS.
New York Office: 30 Church St., New York 7, N.Y.

KOHLER ENGINES

Power for garden tractors, mowers, pumps, sprayers, snow removal equipment, elevators and hoists, portable saws, concrete mixers, compressors, grinders, industrial and lift trucks, and a wide range of tools and equipment for industry construction, farm and home.

Engineered and built to the quality standards that have won acceptance for Kohler Electric Plants the world over.

Kohler Co., Kohler, Wisconsin, Established 1873

KOHLER OF KOHLER

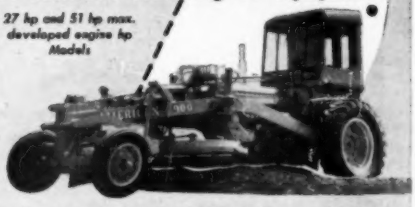
PLUMBING FIXTURES • HEATING EQUIPMENT • ELECTRIC PLANTS
AIR-COOLED ENGINES • PRECISION CONTROLS

MINNEAPOLIS MOLINE
MODERN MACHINERY

INDUSTRIAL WHEELERS

for material handling or equipment

27 hp and 51 hp max. developed engine hp Models



Manufacturing and processing plants use Minneapolis-Moline heavy duty wheel tractors on unusual yard handling operations. A wide selection of attached tools is available for moving bulk or palletized material with small investment.

Manufacturers also use MM wheelers to mount graders, stevedore cranes, revolving cranes, and sweepers. Specifications available on request or ask for recommendation for your product. Engineering service available.

MINNEAPOLIS-MOLINE
MINNEAPOLIS 1, MINNESOTA

Send A Copy of ORDNANCE To Your Friends

. . . WITHOUT CHARGE

American Ordnance Association
705 Mills Building
Washington 6, D. C.

Please send a free copy of ORDNANCE magazine to the persons listed below. I also suggest that you invite them to membership in the A.O.A. (please print).

To .....
Address .....
City .....Z.....State.....

• • •

To .....
Address .....
City .....Z.....State.....

• • •

To .....
Address .....
City .....Z.....State.....

• • •

Sender .....
(PLEASE PRINT)
Address .....
.....

Tough Gear Problems

eating up your time?

Dependable solutions to tough gear application and design problems are our specialty. Solutions in time to meet your most exacting production schedules!

For over 50 years our engineers have concentrated on these problems... accumulated knowledge that has often proved to be the quickest and surest way out.

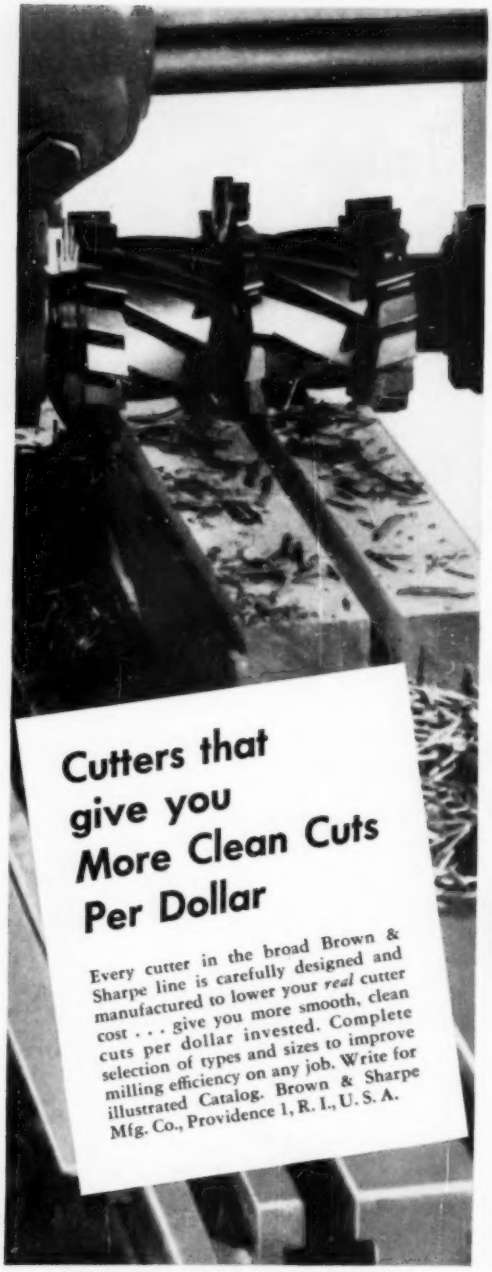
What's more, Fellows has the equipment best suited to your needs for cutting, finishing and testing... whatever they may be.

That's why a call or letter to us may solve your present gear problem... saving time and headaches. There's no obligation, of course.

Fellows

THE FELLOWS GEAR SHAPER COMPANY

Head Office and Export Department, Springfield, Vermont. Branch Offices: 323 Fisher Bldg., Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Bldg., New York 1.



Cutters that give you More Clean Cuts Per Dollar

Every cutter in the broad Brown & Sharpe line is carefully designed and manufactured to lower your *real* cutter cost . . . give you more smooth, clean cuts per dollar invested. Complete selection of types and sizes to improve milling efficiency on any job. Write for illustrated Catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

BUY THROUGH YOUR LOCAL DISTRIBUTOR

B·S

Brown & Sharpe

FIRST STEP TO LOWER MAINTENANCE COSTS

The Right Fuller Floor Brush for Your Floors

BIGGEST SELECTION — Over 170 *different* floor brushes. Widths from 12" to 36" . . . in a variety of materials . . . from soft hair to stiff wire. Wood back or Fullergript construction . . . that will save you money . . . because the Fuller line has the right brush for every job.

SERVICE — Technical assistance by a cleaning specialist — the Fuller Industrial Representative . . . plus fast deliveries from regional warehouses.

ALSO SPECIAL FLOOR BRUSHES — Built to your specifications.

To make sure you have the right floor brush for quick work on *every* job, send for new, illustrated catalog. Write to Industrial Division, The Fuller Brush Company, today.

INDUSTRIAL Fuller BRUSH CO. DIVISION

3585 MAIN STREET • HARTFORD 2, CONN.

Power driven brushes, Factory & Institutional Cleaning Tools, Waxes & Detergents

ABBOTT the BALL with the ARMORED HEART!

Quality is more than "skin deep" in Abbott Balls.

Cold forged from special carbon steel wire, every Abbott Ball is DEEP HARDENED to provide a *thick* armored shell for the soft, resilient heart of the ball. This makes Abbott Balls crush resistant and more efficient under high load factors.

Every Abbott Ball is TEMPERED to insure scientific control of the steel grain structure within the ball. Tempering adds stability and shock resistance—relieves stresses—prevents sphericity and size distortion.

For shock resistance and efficient performance PLUS uniformity in size . . . Specify ABBOTT—the BALL with the Armored Heart!

THE ABBOTT BALL COMPANY
70 RAILROAD PLACE
HARTFORD 10, CONN., U.S.A.

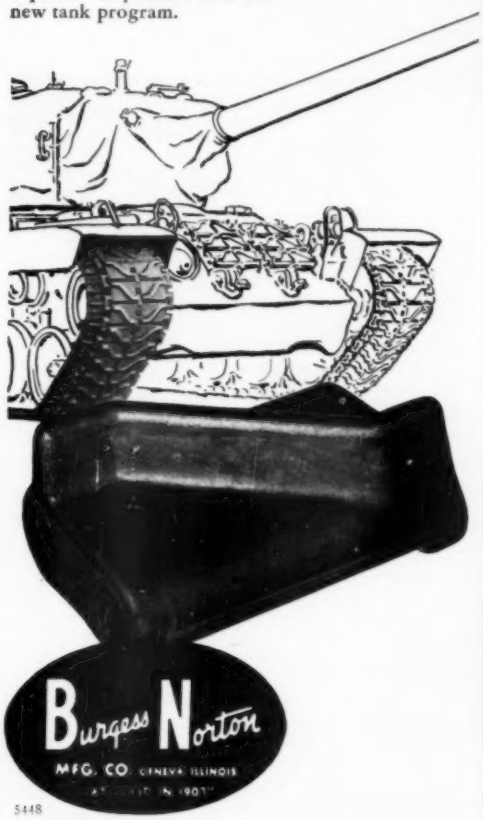
ABBOTT

ONCE AGAIN

the experience, skill and facilities of Burgess-Norton are at work in the production of parts vital to our rearmament program.

In World War II Burgess-Norton played a major part in the development and production of tank track links and blocks.

Since that time our development engineers have been constantly redesigning these track parts to keep pace with the many improvements and design changes in America's tanks. Today we are again in production of new, improved tank links and blocks to meet the expanded requirements of the new tank program.

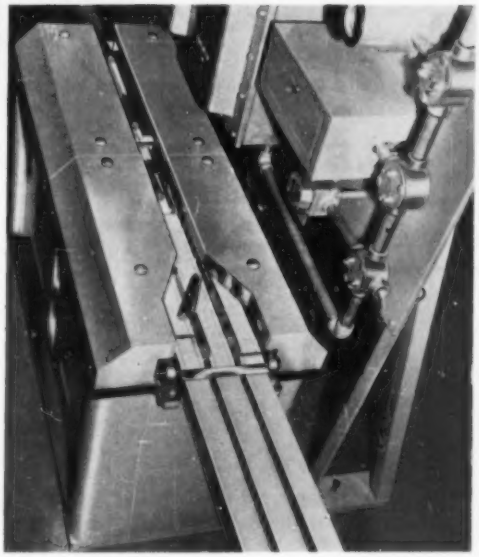


Burgess Norton MFG. CO. GENEVA, ILLINOIS

5448

THERE IS NO SUBSTITUTE FOR EXACT WEIGHT

For Modern Present Day Shell Loading . . .



One of Five SELECTROLS (Model 1200) classifying 20 millimeter shells at the Lake City Arsenal, Independence, Mo.

Modern present day shell loading makes these demands . . . handling large volume . . . speed of operation . . . high accuracy. This is why SELECTROL automatic checkweighing machines are used. Five of these machines have been delivered to Remington Arms Company, Inc., at Lake City Arsenal, Independence, Mo. Remington is the contractor-operator of the Lake City Arsenal for the Ordnance Corps. Here 20 millimeter finished shells are weighed, classified and separated into three groups; underweight, correct weight and overweight to a tolerance of 5 grains, plus or minus accuracy of the predetermined maximum and minimum weight. Speed of operation is 100 per minute. ALL SELECTROLS have explosion resistant housings and meet Class 2 requirements for use in a dust hazardous area. Here is just another case history of successful application of Industrial Electronics for better quality at lower costs. Write for complete SELECTROL details.

EXACT WEIGHT SCALES

BETTER QUALITY CONTROL
BETTER COST CONTROL

THE EXACT WEIGHT SCALE COMPANY

900 W. Fifth Avenue, COLUMBUS 8, OHIO
2920 Bloor St. W., TORONTO 18, CANADA

NEW HIGH IN SPECIALIZED

POWER

3 LBS. THRUST FROM 1 LB. WEIGHT

The J-44 Monocoque Turbo-Jet Engine... Designed and Built by Fairchild

One of the most compact engines in its power class ever produced is the Fairchild J-44 Monocoque Turbo-Jet. Only 72 inches in length, 22 inches in diameter and weighing only 300 pounds, the J-44 delivers a thrust of 1000 pounds.

Another example of a Fairchild design which met difficult and exacting specifications, the J-44 typifies the creative engineering ability of the Fairchild Engine Division.

Right now, the Fairchild J-44 Monocoque Turbo-Jet is being produced exclusively for the Armed Services. When conditions permit, this mighty midget will become available to boost payloads and lower operating costs of airline transports and other aircraft.

ENGINE AND AIRPLANE CORPORATION

FAIRCHILD

Engine Division

FARMINGDALE, N. Y.

Aircraft Division
Hagerstown, Md.

Guided Missiles Division
Wyandanch, L. I., N. Y.

More and more POWER developments for America's Armed Forces

ARMAMENT TECHNOLOGY

This section of ORDNANCE contains articles of a detailed and technical nature on ordnance research, development, manufacture, field use, and related subjects.

Money and Rubber

Both Are Saved at Ober-Ramstadt Tire Rebuild Shop

Bernard Quinn

Chief, Feature Section, Public Information Division, Headquarters, U. S. Army, Europe

THROUGH doors of a special U. S. Army installation in Ober-Ramstadt, near Frankfurt, Germany, pass some of the finest rebuilt tires in the world —onto wheels of hundreds of Army vehicles in the USAREUR area.

750,000 Tires

Over 750,000 old pneumatic tires, collected since the end of World War II from Army salvage centers, discarded vehicles, and vehicle depots all over the Continent, have been processed into practically new types at the Ober-Ramstadt Tire Rebuild Shop since operations commenced in 1946. Through several major stages, the all-important tires, carefully shepherded by a handful of Americans and about 360 Germans, eventually emerge as ready for issue, with 80 per cent of the life of a new tire and at 30 per cent of the cost.

The shop, one of hundreds of installations in the far-flung Ordnance organization in Europe, formerly under command of Brig. Gen. Ray M. Hare, when he was Chief of the USAREUR Division, functions as part of the 7848th Ordnance Maintenance Group, commanded by Col. Philip Schwartz. It is the USAREUR installation which meets all rebuilt-tire needs for the U. S. Army in Europe.

Through the first ten months of 1952, the estimated savings to U. S. taxpayers through repair and reclamation of tires, tubes, tank wheels, and production of molded special items for hundreds of Army needs totaled $886,000.

During the two years ending June 30, 1951, the savings on repairing 233,000 tires and 183,000 tubes, and the manufacture of almost 400,000 molded articles, amounted to an estimated $1,850,000.

In addition to working wonders with used tires, the rebuild shop repairs thousands of inner tubes each month. At the same time the Ober-Ramstadt Rebuild Shop manages to produce over 400 separate types of rubber products for USAREUR needs, ranging from bean-sized grommets and hydraulic brake cups to light aircraft propeller diaphragms and engine mounts. All such special items are molded, and the necessary molds are made right at the shop.

During recent months the rebuilding or replacing of rubber on tank wheels, known as "solid-type" work, has become an important part of the shop's activities. Such wheels, mostly M24 and M26 tank types, are collected at a central point and then processed at Ober-Ramstadt as required.

Some wheels require entirely new rubber, known as rubber-to-metal processing; others can be repaired by grinding down the original rubber, then attaching the required amount of new packing. The wheels are then inserted in molds where the rubber is baked.

Long Experience

The process which transforms a battered, oftentimes war-weary tire into a glistening black, diamond-treaded affair, fit for service on vehicles ranging from jeeps to road graders, is one developed through almost seven years of experience. As such, it is the major activity at the plant.

An average day's output of ready-for-issue tires is 250, based on an 8-hour working shift. They are from the tires which arrive in carload lots, and they immediately undergo check-

CONTENTS

Money and Rubber 1049
Bernard Quinn
Defeating Corrosion 1052
A. R. Black and A. Wachter
Psychology Goes to War 1055
Ernest Conine
New Ordnance Paints 1060
Dr. C. F. Pickett

ing to determine if they merit rebuilding. (Some tires are discarded and salvaged for scrap use at this point since their repair would be uneconomical).

There is no wastage at Ober-Ramstadt. All excess rubber, much of it obtained from molded products, is reprocessed and appears in scores of rubber items for Army vehicles, and in such products as the stair and floor matting used in installation offices and workshops.

Tires which pass inspection enter the buffing room. There the tire surface is ground away sufficiently to permit application of the black recap stripping known as "camel-back." Tires with cuts, bruises, and gouges are given special processing in what is known as the skiving room.

Tires sufficiently damaged to require removal of a portion next pass through the "section build-up" phase. There, by a vulcanization process, the removed section is restored. That section of the tire with the new inset is then placed in one of the scores of special molds utilized only for section baking.

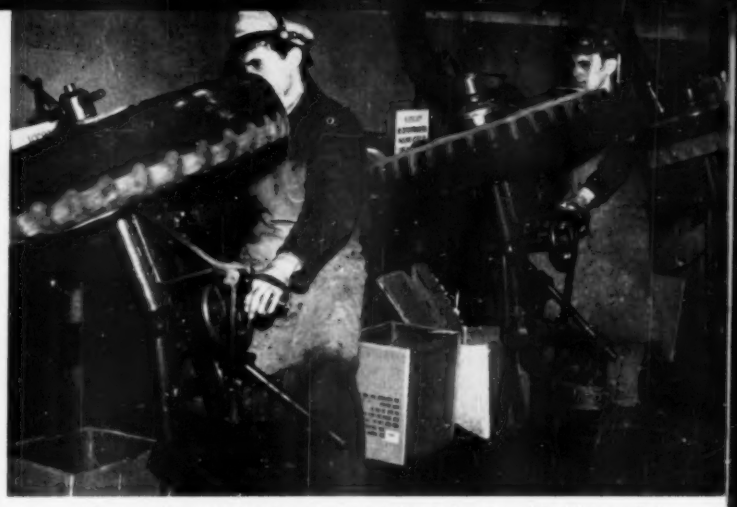
When a tire leaves the buffing room it normally goes directly to the recapping section. There, through a combined manual and mechanical process, long strips of special black recapping are cemented onto the tire body.

From there it goes to the molding department and into one of the sixty-nine full-recap-type molds, with different molds being used on the basis of the tire size and tread style.

Objects Imbedded

Grinding off old tread on tires in the initial stage of rebuilding reveals what can lodge in a tire. Objects imbedded deeply in the rubber are sometimes impossible to find in the initial inspection and are discovered only in the grinding down process. Wartime relics such as machine-gun bullets—including caliber .50 types—have exploded within tires. Old coins, chisels, door handles, and spikes have been removed at various times during processing.

Reclamation of an average of 5,300 inner tubes each month, at an estimated cost of 67 cents each, is a vital part of the repair program and ranges from the initial water test for leaks to the final repair.



Above, workmen grind old tread off used tires before "camel-back" is applied. Below, inner tubes are tested for leaks at the Ober-Ramstadt Tire Rebuild Shop.

Below, completely recapped jeep tire is removed from a heated tread mold at the rebuild shop. Another tire is still baking in the closed mold at the far left.

Tubes of all sizes are repaired for the same price, based on the costs of processing about 53,000 during the first ten months of 1952.

The shop has facilities for all types of molding, including 5-unit tank-wheel molds which bake the rubber application onto the metal disks. Scores of other special mold types make possible the production of various-sized washers, gaskets, housings, weather stripping, windshield wiper bands, shock absorbers, bushings, seals for windshields, and master-cylinder boots.

These items, plus many other types, comprise the rubber molded products produced at Ober-Ramstadt since 1946 as by-products of the tire and tube program.

Output Increased

The output of tires and allied products in general has been stepped up under special circumstances. The Berlin blockade demonstrated the flexibility of the tire plant. Within forty-eight hours after the first "airlift" orders were received, the plant succeeded in tripling its large-size tire production.

On the basis of monthly studies made during the first ten months of 1952, the unit cost of various tires, by sizes, showed that a tire for World War II type jeeps and some sedans costs $5.52 to rebuild. The present retail price is about $16.

Savings increase with the size of the tire. For instance, the new 6x6 truck tire can be rebuilt at Ober-Ramstadt for $12.93, or about one-third the current retail price.

Tires are rebuilt for old and new type 2½-ton trucks, ¾-ton types, semi-trailers, tractors, and other specialized heavy-type vehicles.

Special Tread

Most of the tires are finished in a special civilian-type diamond tread which was first experimented with and used in Africa and which is now in general use in lighter military vehicles.

All work at the Ober-Ramstadt shop is based on Ordnance maintenance orders which are requisitions from USAREUR Ordnance headquarters in Heidelberg and represent Army vehicle rubber needs from all parts of USAREUR.

"Camel-back" stripping is applied to a tank wheel in a rubber-to-metal process.

After recapping, tank wheels are baked in this new five-unit heat press mold.

Lieut. Col. Martin W. Steward, commanding officer of the 7844th Ordnance Tire Rebuild Detachment, under which the tire-rebuild shop functions, is a veteran hand at transforming used Army material.

From 1945 to 1947 he was in the Pacific theater, directing operations of a vehicle-reissue depot at Manila. After duty at Fort Sill, Okla., he went to the Karlsfeld Ordnance Depot, Germany.

When an Ordnance depot was being set up at Mainz to handle tanks, artillery weapons, and fire-control equipment, Colonel Steward was chief of supply operations. A year later he was transferred to Ober-Ramstadt.

Excellent Records

The Ober-Ramstadt Tire Rebuild Shop during its nearly seven years of operation has set excellent records in labor relations, industrial safety, and safe driving in vehicle operations. Over 40 per cent of the 357 German workers have been at the plant for 5 years or more, while 28 per cent have worked there from 2 to 5 years.

There have been only two lost-time accidents at the plant during the eleven months ending November 30, 1952. Drivers operating the shop's motor pool vehicles have driven almost 500,000 miles during the past year without an accident.

EDITOR'S NOTE.—In an interesting and timely article, "Rubber and National Defense," published in the January-February 1953 issue of ORDNANCE, J. E. Trainer, vice-president of Firestone Tire & Rubber Company, discussed the importance of the product to Army Ordnance.

Rebuilt tire is given final inspection by an American Army sergeant at the Ober-Ramstadt Tire Rebuild Shop prior to being issued for use on U. S. Army vehicles.

Defeating Corrosion

Vapor Phase Inhibitors Provide Easy Means of Protecting Steel from Rust

A. R. Black and A. Wachter

ONE of the latest materials to be pressed into service against industrial and military loss from corrosion is "VPI" (dicyclohexylammonium nitrite), a volatile corrosion inhibitor particularly advantageous during storage and shipping of steel products.

While it is not intended to displace conventional methods of corrosion prevention entirely, it provides a new, effective protection under certain conditions without costly application and removal of thick film compounds and greases. The term, "VPI" is a trademark of the Shell Development Company.

Migratory Inhibitor

VPI is in the class of so-called migratory inhibitors possessing sufficient vapor pressure, when introduced into an interior package or wrap, to cause vaporized molecules to migrate to the metal in the vapor phase and to prevent corrosion from atmospheric condensate.

Prior to the introduction of this chemical it was established that nitrites could prevent corrosion and sodium nitrite often was used as a direct-contact material. Ammonium nitrite, stable only in dilute solution, is subject to explosive decomposition as a dry solid.

However, it was found that certain organic ammonium nitrites could be isolated as relatively stable crystalline solids with a measurable vapor pressure. Dicyclohexylamine nitrite is an outstanding member of this group. Thus VPI is undergoing major current study, test, and application and is initially available as a white crystalline powder.

Various Uses

Methods of application include its use as a powder, in water and alcohol solution, and in controlled coating on kraft paper, the paper acting as a carrier and a barrier.

Since this amine nitrite is moderately soluble in water, its protection of steel cannot be ascribed to formation of a hydrophobic adsorbed film. Neither can it be ascribed to development of alkaline pH because an aqueous solution of the compound has a pH near 7, nor to the consumption of oxygen because the pure compound does not react detectably with oxygen from the air.

Likewise, its action cannot be attributed to moisture absorption by the salt because the compound is relatively nonhygroscopic. Consequently, since the vapors condense to give VPI crystals, it is concluded that the compound protects through the vapor phase by contributing its nitrite ion to condensed or adsorbed moisture on a metal surface, its volatility being a means of transport for the inhibitor.

Both Mr. Black and Mr. Wachter are actively concerned with the development of volatile corrosion inhibitors. Mr. Black is on the technical staff of the Shell Oil Company; Mr. Wachter is associated with the Shell Development Company.

A volatile inhibitor of corrosion, to be applicable for protective packaging, must be easy and economical to apply, positively effective in preventing corrosion in a wide range of atmospheric conditions, and free from objectionable properties.

Melting Point

It has been determined that VPI melts at 392 degrees Fahrenheit with decomposition, is practically odorless, and the pH of its aqueous solution is about 7.2. It has about one-tenth the vapor pressure of mercury at room temperature, and it has been calculated that a gram of VPI would saturate about 20,000 cubic feet of air at room temperature.

It is moderately soluble in water, very soluble in methyl alcohol, and decreasingly soluble in increasing mo-

lecular-weight alcohols and other chemical solvents, and practically insoluble in hydrocarbons.

Toxicity studies, important in view of the widespread commercial applicability of the chemical, reveal no cumulative toxic effects nor were local irritant effects on skin observed.

No Special Hazards

These results and commercial experience thus far indicate that undue hazards are not introduced under normal handling and use conditions.

A few of the exhaustive tests reveal certain significant data on various characteristics of this volatile corrosion inhibitor.

Humidity-cabinet tests were made in 1- by 6-inch glass test tubes, and glass hooks were attached to the outside bottom of each to make suspension in an inverted position possible. Another glass hook was sealed to the bottom on the inside for suspension of a steel test strip.

A piece of kraft paper impregnated with VPI (one gram VPI per square foot) and large enough to cover the inside surface of the tube was placed in the test tube, along with a ¼- by 3-inch polished strip of SAE 1020 steel. The tubes were then closed with a cork having a ⅜-inch diameter hole and suspended in a humidity cabinet at 100 degrees Fahrenheit and about 100 per cent humidity for 400 hours.

A large number of such tests showed complete protection against rusting while those controlled with untreated kraft paper rusted considerably.

Extended Test

A vapor-phase corrosion test of long duration at 150 degrees Fahrenheit was made with polished steel strips suspended separately in tall-form quart bottles containing a small amount of VPI crystals and water. The bottle screw caps were drilled to provide a different diameter hole in each in order to allow escape of VPI vapors.

The bottom edge of the steel strip was about 4 inches from the bottom of the bottle over which was spread 0.5-gram of VPI crystals.

A small glass beaker containing about 5 milliliters of water was also placed in each bottle and the water replenished as necessary. Vent holes in the three bottles containing VPI were ⅛-inch, ¼-inch, and ½-inch in diameter. The hole in the bottle containing no VPI was ¼-inch in diameter.

After 6 months' exposure at 150 degrees Fahrenheit the steel strips above the VPI crystals were protected fully but the strip in the fourth bottle was heavily rusted.

Corrosion tests were made with small packages using VPI coated paper in a laboratory climatizer in which humidified air (95 to 100 per cent humidity) was passed separately over each package at 20 feet a minute. The air temperature was cycled under automatic control—4 hours at 60 degrees Fahrenheit, 16 hours at 93 degrees Fahrenheit, with 4 hours' heating and cooling between these temperatures.

These tests were made for a total of 28 days with clean polished heavy bar steel (1- by 1- by 3-inch) specimens wrapped in VPI coated paper in cardboard boxes overwrapped with kraft-asphalt-kraft paper.

Controls Used

Controls, identical in every respect, except that VPI was omitted, were tested at the same time. Typical results shown on page 1054 indicate the comparative protection provided.

Other tests show that VPI prevents further rusting of steel which has already rusted. Three separate drops of water were placed on each of four steel strips, which were allowed to stand at room temperature until dry. Each of these spots became rusted. Two of these strips were then wrapped in VPI coated paper (one gram per square foot) and two strips wrapped in untreated paper.

Results of Test

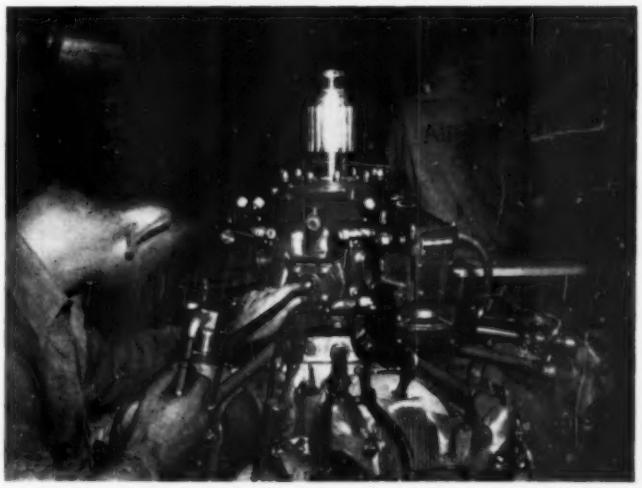
After 500 hours' storage at 100 degrees Fahrenheit in a closed container with sufficient water to reach 100 per cent humidity, the strips were removed and photographed again. The strips wrapped in the untreated paper were almost completely rusted.

Polished steel strips were suspended in 250-milliliter glass-stoppered bottles lined with one gram per square foot VPI coated paper and containing 0.5-milliliter of water. Each steel strip was about one inch from the sides and one inch from the bottom of the bottle. Control tests were also made with uninhibited kraft paper.

Bottles were stored for 14 days at minus 30 degrees Fahrenheit, then 4 hours at room temperatures (about 70 degrees). This cycle was repeated four times.

On page 1054 is shown the results of outdoor exposure testing over a 5-year period near San Francisco Bay, with specimens protected with untreated kraft paper, protective oil, and VPI-coated paper.

Technician blows VPI crystals into breathing points of an aircraft engine to protect them against rust during shipment and storage, particularly in high-humidity areas.



Oil is often present on a packaged machine or part, and since VPI is practically insoluble in hydrocarbon fluids it is important to know if absorbed oil impairs its effectiveness. Package exposure tests have indicated that neither lubricating oils nor rust-preventive oils diminish the degree or duration of protection.

Various field experiences shed considerable light on the function of this volatile corrosion inhibitor. One such application concerns an overseas shipment of M1 rifle barrels from Springfield Armory. The barrels had been covered with a light coat of oil and then wrapped in paper which had been coated with VPI crystals.

Condition Excellent

Upon arrival, fifty per cent of the barrels were inspected and found to be in excellent condition while the remaining fifty per cent were stored and examined at a later date.

A final report revealed that the barrels were in perfect condition. All unblued surfaces were still bright, with a thin film of preservative adhering to them, and the blued or Parkerized surfaces had the same appearance as a newly processed part. Barrels could be assembled to a receiver merely by wiping the breech-end threads.

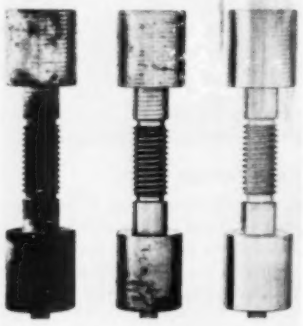
On M3 caliber .50 aircraft machine guns protected in this manner there was a direct saving of about two dollars in packaging costs and a 5-pound reduction in shipping weight per weapon. Cleaning time was 8 minutes (including 5 minutes for opening the box) by this method as against 2 hours and 45 minutes per weapon for the heavy-type preservative method.

Engines Protected

VPI is being used for protection of aircraft engines under extremely adverse conditions of humidity by the Pacific Alaska Division of Pan-American Airways and is now a standard preservative material. Tests included shipping a Pratt & Whitney R-4360 engine on the deck of a ship. Cylinder spraying is omitted, and each cylinder is treated through the spark-plug holes with two grams of the volatile corrosion inhibitor.

The rear spark-plug hole is fitted with a modified Protek plug containing VPI treated paper and pierced to allow breathing. The nose section is treated with 4 to 6 grams of the crystals, the power section received 10 to 12 grams, and 2 to 4 grams are placed in the blower section. The propeller shaft is wrapped in VPI paper.

VPI-treated paper preserved the steel bar, above right, during humidity test that corroded unprotected bar at left.



Above, results of a 5-year outdoor exposure test. Left, untreated specimen; center, one protected in oil; right, one protected with VPI-treated paper.

In some cases the entire engine is wrapped with the paper while in others strips of the paper are inserted in the shipping containers. Pan-American Airways estimate that they have decreased preservation costs by more than fifty per cent.

Can Be Sprayed

Volatile corrosion inhibitors can also be dissolved in alcohol and sprayed to protect various products. Wheeling Steel Corporation protects the interior of steel drums with a five per cent solution of VPI in S. D. (special denatured, 23-A) alcohol, and conventional paint spray guns are used to fog the solution into the steel drums. The amount of solution required varies in this manner:

Drum size	*VPI solution*
5 gallons	2 to 3 grams VPI
30 gallons	6 to 8 grams VPI
55 gallons	12 to 15 grams VPI

Both "VPI 260" and "VPI 220" solutions are used at Wheeling Steel. "VPI 220" (five per cent) in S. D. alcohol is used for tightheaded drums, and "VPI 260" is employed for openheaded drums.

Another application, by Boston Gear Works, involves a water solution of the inhibitor into which parts such as gear blanks, shafts, and other machined parts are dipped and protected against rust between operations, over weekends, and during shutdowns.

This method replaced conventional thin-film protection which, although reasonably effective, made parts messy to handle and store, or caused adherence of metal chips which made chucking alignment difficult.

Solution Effective

Experience at Boston Gear Works indicates that a two per cent VPI water solution by weight renders the water incapable of producing corrosion. Parts are dipped after machining operations and again after grinding operations before being stored in tote boxes and covered with plywood lids.

A few of the characteristics of VPI suggest a range of possible advantages:

1. Excellent long-term storage protection if properly applied and the inhibitor vapor level maintained.

2. Prevents corrosion even if the package becomes punctured or damaged enough to allow entry of moisture vapor which normally would promote corrosion.

3. Vapors will protect surfaces of assemblies that cannot be reached by other means.

4. Cleanliness in application.

5. Eliminates degreasing operations and the hazards resulting from them as well as effecting consequent economies in labor and material.

6. Provides protection under arctic, temperate and tropical storage conditions.

7. Enables inspection to be made easily without depreservation.

Members of the Army's unique psychological-warfare unit, left, set up a loudspeaker for broadcasting to enemy troops somewhere on the Korean front (Army photo).

Psychology Goes to War

As a Support Weapon It Can Save Both Time and Lives

Ernest Conine

"PSYCHOLOGICAL warfare is the world's biggest flop," a recent returnee from Korea commented emphatically. "Sure, I know it's supposed to be great stuff. But in my area, I don't think it pulled in more than a dozen prisoners."

Such a statement reflects an all-too-typical misunderstanding of one of the most promising weapons in Uncle Sam's arsenal.

No Miracle Weapon

Psychological warfare is no miracle weapon which can win a battle with a well-chosen word. But it can save American lives. It can shorten a war. And, at its best, it conceivably can spell the difference between victory and defeat.

But it can accomplish these things only when its proper employment is understood by the men it is intended to serve—the combat officer and his troops.

Although psychological warfare first might appear to be strictly a "long-hair" endeavor, the basic principles of its employment are simple. Once understood, it becomes a powerful weapon for the combat commander.

"Just what is psychological warfare," asks the newcomer, "and what can it do for me?"

In the broad sense, "warfare psychologically waged," consists of military operations carried out with close and studied reference to the politics, opinions, and morale of the enemy.

Psychological warfare as a support weapon however, can be defined as the use of propaganda and related measures to affect the minds, emotions, and behavior of enemy or friendly foreign groups in such a way as to gain a specific tactical or strategic objective. In the combat zone, psychological warfare is primarily the business of putting ideas into the enemy soldier's head that will make him a less effective fighting man.

Mr. Conine is a correspondent for the *Houston Chronicle*. Now a Reserve lieutenant, he formerly served on the staff and faculty of the Psychological Warfare Center, Fort Bragg, N. C.

Active in War Theater

The Army conducts psychological warfare only within a theater of war; where the "cold war" hasn't come to a boil, the State Department is the responsible agency.

Recognition of the psychological factor in combat is not new. Military commanders have long known that the road to victory is shorter if two goals are achieved: destruction of the enemy's *ability* to fight, and destruction of his *will* to fight.

Firepower makes the enemy lose

stomach for the fight by knocking the starch out of him physically. Psychological warfare (or "psywar" as it is known) comes in through the back door; it plays upon the enemy soldier's fears, jealousies, hopes, and suspicions in order to lower his fighting ability. Psywar gives the enemy soldier a rationalized excuse to yell "uncle" before he otherwise would.

told that surrender would be accepted if he would move along the road and proceed toward U. N. forces. Several groups of enemy soldiers responded immediately and surrendered.

"Following the broadcasts, several groups of enemy troops were seen moving north from the roadblock area, and friendly forces on the north side of the road were able to advance without

way out by broadcasting surrender instructions.

Every army is vulnerable, in some degree, to psychological warfare. But the Communist enemy in Korea is especially open to psychological attack. Intelligence reports indicate that all is not well within the ranks of the CCF and NKA.

The Red army includes ex-Nationalist

Army photo

Above, a bomb-type adapter is loaded with 22,500 psychological-warfare leaflets to be dropped over Communist territory in Korea.

Army photo

Bundles of propaganda leaflets are loaded aboard a lightplane for distribution over enemy territory.

For example, a commander charged with reducing an enemy position may have to destroy sixty per cent of the enemy before he can achieve his mission. But, by utilizing psychological warfare to increase the impact of his firepower upon the mind of the enemy soldier, he may gain his objective after having destroyed only forty per cent of the enemy force.

Good Illustration

A report from Korea gives an excellent illustration of this principle. A loudspeaker-equipped airplane was utilized to support the 38th Infantry Regiment in the vicinity of the Inje-Hyon-ni road. The voice plane had radio contact with ground forces through a 2nd Division liaison plane also assigned to the mission.

"All ground fire was stopped," the report relates, "while the voice aircraft broadcast to a group of enemy soldiers blocking the road. The enemy was told why the fire had stopped; that he was in a hopeless position from which his only escape was surrender. He was

further resistance. The final broadcast informed the remaining enemy soldiers that their chance to surrender had passed and they would now be killed. Artillery, which had been standing by, immediately opened fire."

Obviously, this was a highly successful action which saved American lives. But who should get the credit? The artillery? The infantry? The Air Force? Or psychological warfare?

All played a part. The point is this: psychological warfare is a support weapon in the same sense as armor, artillery, or tactical air.

Threat of Force

The Communist soldiers who surrendered in the action described above did not quit the fight merely because a loudspeaker airplane circled above making threats. It was the presence of artillery and infantry, ready and able to turn concentrated fire on the enemy troops that made the threat effective.

The enemy troops probably would have fought to the end, however, if the voice plane had not offered them a

soldiers who have known and liked Americans in the days before the Communist scourge spread over China. It includes South Koreans impressed into Communist service during the Red drive south.

Susceptible Prospects

There are homesick Chinese and Korean farmers who long to return to their tiny plots of ground and their families before the next harvest. The Communist forces include Koreans who resent Chinese presence in their homeland, and Chinese who view Koreans with contempt and distrust.

And there are many youthful Red troops who went into battle believing the United States was only a "paper tiger." These youths are disillusioned to find that the American tiger packs a powerful wallop in the form of concentrated artillery fire, air attacks, automatic weapons, and armor.

Many soldiers in the Red forces need no sales talk to convince them that Communism is bad. They have seen it in practice. Some go into combat with

the idea of desertion or surrender already in their minds. But they find that such a step is not easy. They are watched by fanatic party members. They are warned that families of deserters are imprisoned. They fear they will be shot by one side or the other while trying to surrender.

Psychological warfare's job is plain here—to increase the soldier's discontent and to channel this discontent into acts of defection. This defection may take the form of surrender, desertion to the rear, or actual mutiny.

Army photo

Standing at the drop door of a C-47, a member of a psychological-warfare unit looks for Chinese Communists while leaflets are loosed over North Korea.

Safe-Conduct Pass

In this connection, one of the most effective weapons in Korea has been a slip of paper somewhat larger than a dollar bill. It is the safe-conduct pass—the enemy soldier's ticket to safety and good treatment as a prisoner of war. It is made to look like Chinese or Korean money, so the enemy soldier can hold onto it with the less fear of detection by his political officer.

This leaflet serves as insurance for a rainy day. It is a constant reminder that death on the battlefield is unnecessary. When the Red soldier gets in a tight spot, he has a way out.

However, it is important to remember that the disaffected enemy soldier may well help us more by staying on his side of the lines.

Reports from the Far East indicate that a "large majority" of Communist deserters move north or hide among Korea's tortuous mountains instead of trying to surrender. These are the psywar "casualties" who will rarely show up on an after-action report.

Such deserters may be more valuable to us than prisoners within a barbed-wire enclosure. Not only is their fighting effectiveness lost to the enemy, but they pose a security problem which can be met only by diverting manpower the enemy may need badly at the front.

One Chinese political officer tried to surrender with 300 former Chinese Nationalist troops. He failed because he was intercepted by a Communist battalion—but the defection was squelched only after hours of bloody fighting, and the enemy was forced to expend considerable manpower and supplies in order to suppress an uprising which the political officer admitted had been partly inspired by U.N. leaflets which he had been secretly reading.

Chain Reaction

Such an incident not only cuts the fighting strength of the enemy, but increases the air of tension in the enemy camp. Word of the uprising spreads, resulting in stronger Communist control methods and still more anti-Communist resentment. And this resentment creates a fertile field for more propaganda.

Not all military propaganda, however, is aimed at the soldier who is predisposed toward our way of thinking. Even the most loyal soldiers are susceptible to subtle propaganda aimed at lowering their morale. The experience of an American division in World War II is an excellent example.

This division was taking a well-earned rest after playing a brilliant rôle in the Sicilian campaign. Not having much else to do, they fell into the habit of listening to Axis Sally's entertaining programs.

Rumor Started

In the midst of a musical broadcast one day, Sally announced she had just heard this particular American division was being rotated to the States to take part in a bond drive.

This was the kind of rumor homesick soldiers like to believe. And they did. Nervous excitement gripped the entire camp. When the division commander was forced to announce officially that the outfit was not going home, morale hit rock bottom. That division had to be withheld from combat while the morale situation was remedied.

Propaganda may be used also to deceive or confuse the enemy. Leaflets warning inhabitants to "stay away from the beaches" were disseminated along the southwest coast of Korea prior to the Inchon landings. Some Communist troops thus were drawn southward, leaving the gateway to Seoul less strongly defended.

False Optimism

Another technique is the building of false optimism among enemy troops when an enemy defeat actually is imminent, in order to make defeat more demoralizing when it comes. One method is with news leaflets which steadily play up small-scale enemy victories and play down our own victories.

Just when the enemy soldier's guard is down, the psychological rug is jerked from under him by a strong offensive. Mentally unprepared for a fight, the enemy may be crushed more quickly.

Psychological warfare also helps military government control civilians in occupied or liberated areas. One of the biggest headaches in modern war is the problem of what to do about the thousands of homeless people who wander about in the wake of an advancing army, creating confusion and posing a potential threat to lines of communication.

Here, too, psywar is invaluable. Through the use of loudspeakers, posters, and handbills, these people are told what is expected of them. Orderly conditions return as military government proclamations concerning blackouts, curfew hours, and distribution of food and clothing are publicized.

Control of Civilians

In addition, dissemination of news helps dispel the rumors which thrive on confusion. Similarly, psywar can help in controlling civilians who clog roads when an army is trying to withdraw or advance.

Although psychological warfare is a user of intelligence rather than an intelligence agency and is interested in enemy vulnerabilities rather than capabilities, important information about the enemy often is gained as a by-product of analyzing enemy propaganda output and interrogating prisoners for psywar purposes:

A brief glimpse at psychological warfare organization helps in understanding what the combat man can expect in the way of psywar support and what he can do to increase the effectiveness of that support.

The basic tactical unit is the loudspeaker and leaflet company, assigned normally on the basis of one company per field army. It includes a reproduction platoon which does the actual job of printing propaganda leaflets. And it includes a loudspeaker platoon, consisting of teams which are generally attached to divisions and employed directly with infantry battalions or companies to exploit situations ripe for psychological warfare.

Loudspeaker Tactics

Loudspeakers usually are transported in a jeep trailer, then set up as close to the enemy as possible for the actual broadcast. Airborne loudspeakers have also been used extensively in Korea. Speed and range enable loudspeaker plane crews to address several target groups within a short period of time.

Tank-mounted loudspeakers were employed with great success in World War II and have been used in Korea. They are especially valuable in exploiting situations created by fast-moving armored spearheads.

At present, psywar staff officers are authorized only at army and corps levels. These officers, trained to recognize and exploit vulnerabilities in the enemy's psychological make-up, work under supervision of the G-3. This facilitates the task of integrating psywar operations with over-all military operations.

Army and corps psychological warfare officers receive excellent coöperation from division G-3 staff sections in Korea. This coöperation would be made even more effective with inclusion of a full-time psywar staff officer at division level.

Many psywar operations are born when staff officers, poring over intelligence and operations reports, discover weaknesses in the enemy's psychological armor. Commanders at lower echelons also request psywar support through regular channels when they encounter special situations they believe are ripe for psychological exploitation.

"Although psychological warfare is a user of intelligence rather than an intelligence agency . . . important enemy information often is gained as a by-product."

These requests are generally routed through the corps psychological-warfare officer and forwarded to army for action.

Where the enemy appears to be vulnerable to psychological attack, the army psywar section, through the loudspeaker and leaflet company, provides psychological-warfare support in the form of leaflets and loudspeaker broadcasts or both.

Leaflets are prepared on the basis of available intelligence and loaded into artillery shells or sent to forward airfields for aërial dissemination. The shells, properly labeled, are distributed through Ordnance channels and their use is coördinated with the tactical operation.

The combat commander's personal contact with psywar may begin when a jeep and trailer loaded with loudspeaker equipment arrives at his command post. Two noncoms—or a noncom and a native civilian linguist—climb out and report to the S-3 as a loudspeaker team sent forward to conduct operations in that sector.

The commander can do much to aid the loudspeaker team in accomplishing its mission.

The immediate requirement is adequate, up-to-date intelligence. The propagandist must know the enemy's vulnerabilities—his hopes and fears, his gripes and his jealousies. He should know as much as possible about the opposing unit's combat history, what part of the enemy homeland most members of the unit come from, and the weaknesses of officers of the unit.

Desirable Data

If he is particularly lucky, he may learn the status of enemy supply and medical services, the enemy soldier's attitude toward our firepower and whether he considers desertion and surrender dishonorable. He may know which officers the soldiers hate and whether the enemy soldier fights from ideological conviction or from compulsion.

The loudspeaker team should have much of this information. The commander and his staff often can provide the rest. When the team chief understands the combat situation as viewed from the enemy soldier's eyes, he is ready to tailor an effective propaganda appeal to the enemy. The situation may call for a surrender appeal. If enemy morale is high, themes or music aimed at creating homesickness may be the only practical course.

The content of loudspeaker broadcasts are generally written by the psychological-warfare operator. From experience he is acquainted with the pitfalls of the business.

For example, he knows that broadcasts insulting enemy troops may salve the feelings of our forces but only stiffen enemy resistance. He knows the importance of proper timing. A surrender appeal to a unit with high morale is like trying to sell a bulldozer to a concert violinist.

"Dos and Don'ts"

In addition, loudspeaker personnel are familiar with the mandatory "dos and don'ts" of propaganda. They are kept informed of changing policy directives which are aimed at preventing the mishandling of propaganda topics which could embarrass the army or theater commander in the conduct of his military operations.

The recommendations of the commander are vital however, and the ultimate decisions on coördinating the propaganda broadcasts with his military operations rests with him.

Troops Briefed

The loudspeaker broadcasts to the enemy sometimes are preceded by an English-language address to American troops—explaining the purpose of the broadcast and requesting coöperation of the troops.

This is done in recognition of the fact that the infantryman, in the final analysis, can make or break combat psywar. If the propaganda message urges the enemy soldier to surrender, he must be confident he won't fall victim to an infantryman who "shoots first and asks questions later."

One enemy soldier killed while trying to surrender may discourage hundreds of others from making the same attempt. And these enemy soldiers who reluctantly elect to fight rather than surrender may exact a needless toll of American lives, in addition to losing faith in future promises made through American propaganda.

This poses a grave problem. No soldier who has seen enemy forces pretend surrender, then open up with hidden weapons, is anxious to have the experience repeated. Leaflets prescribing exact surrender procedures help prevent such ruses.

The most effective psychological warfare operations are those carefully timed and coördinated with over-all operations. For maximum effect, a combat loudspeaker broadcast may be coordinated with an infantry or tank assault or an artillery barrage. It may be supplemented by a leaflet drop. Only one broadcast may be needed, or an entire loudspeaker campaign may be necessary to lead the enemy soldier to the point of defection.

Classic Example

A classic example was Operation Tomahawk, in late March 1951. Some 4,000 paratroopers of the 187th RCT were dropped near Munsan-ni, 15 miles north of Seoul, to cut off retreating Reds.

Leaflets playing up superiority of U. N. firepower and methods of surrender had been rained on the area for days preceding the drop.

On the day of the drop, a voice plane headed south of the drop zone and broadcast a message to North Korean units that were between the paratroopers and the U. N. lines. The Communists were told they were now cut off by a mighty force of paratroopers and must cease resistance immediately if they expected to stay alive.

> *"Many soldiers in the Red forces need no sales talk to convince them that Communism is bad. They have seen it in practice. Some go into combat with the idea of desertion or surrender already in their minds. But they find that such a step is not easy. . .*
>
> *"Psychological warfare's job is plain here—to increase the soldier's discontent and to channel this discontent into acts of defection. This defection may take the form of surrender, desertion to the rear, or actual mutiny."*

Leaflets Dropped

Then the plane flew to the area east of the Seoul-Uijongbu road where the same message was broadcast to Chinese troops on the flanks of the North Koreans. Leaflets showing paratroopers descending on a vanquished enemy were distributed over troop cencentrations and supply routes.

Brig. Gen. Frank S. Bowen, commander of the 187th Regimental Combat Team, reported that the operation was "decidedly effective."

"We took 126 North Korean prisoners during that attack," he said, "and practically every prisoner we captured was waving a safe-conduct pass."

The official report concluded that "in its rôle as an added weapon, the support given Operation Tomahawk by psychological warfare is considered as having had a share in the successful conclusion of the over-all mission."

"A Share in Victory"

That is the continuing goal of psychological warfare—to have a share in victory. Psychological warfare will never win a war singlehandedly any more than artillery or armored forces. However, experience has shown that psywar—when used in close coördination with the combat soldier's shooting weapons—makes victory cost less in terms of time and lives.

Three members of a U. S. psychological-warfare team in Tokyo broadcast a special news program to the Communist-held areas in North Korea (Army photo).

Army photo

New Ordnance Paints

Recent Developments in Lacquers For Good Surface Preservation

Dr. C. F. Pickett

THE surface finishing of Army Ordnance matériel has undergone some marked improvements within the past couple of years. Greater consideration has been given to the necessity for proper metal preparation and painting. The layman considers ordnance matériel as expendable, hence not requiring any unusual protection and in any case not involving any more than the usual problem of metal finishing.

Preservation Needed

The Second World War clearly indicated the necessity for proper surface preservation as evidenced by the condition of some of our equipment in the various theaters of operation.

It is recognized that the military needs for surface preservation may differ considerably from the normal civilian requirements. Atmospheric exposure alone embraces global proportions ranging from desert, steaming jungle, temperate, and arctic climates. Storage of matériel is often done without the benefit of shelter and in many instances for long periods of time.

Most Ordnance paints are made in the semiluster or lusterless range of gloss for camouflage purposes; however, in general, this higher pigmentation tends to detract from the over-all durability. Much of the ordnance matériel is used or operated in the field without benefit of paved roads, concrete aprons, or floors.

More Than Appearance

The need for surface preservation of equipment goes beyond mere appearance. Items of light-gauge steel, such as automotive and trailer equipment, can rust away unless properly painted. Shells, though of heavy gauge, can become much less useful if allowed to rust and corrode because if sufficiently rusted they will not breech properly, cause undue tube wear, and detract from the ballistic characteristics.

Elimination or reducing of repainting saves a costly operation. While the repainting of automotive equipment, guns, and tanks is expensive it is less costly than the repainting and renovation of shells. In addition, renovation of shells and bombs is a hazardous operation.

Repainting ordnance matériel, and particularly shells, during time of emergency may present a serious problem because of lack of trained personnel and facilities. Repainting in a theater of operation becomes even more difficult.

The proportionate cost of proper surface preservation compared with the over-all cost of the final item is generally far less for ordnance matériel than for civilian items.

Paints used on Army Ordnance matériel are procured on specifications. In order that these specifications may be effective it is necessary that they be explicit for it cannot reasonably be expected that a paint manufacturer can supply the desired quality of paint unless it is adequately described.

Experience has clearly indicated that the most desirable procedure is to stipulate composition, physical characteristics, and performance requirements. It has also been found that methods of chemical analysis and tests for physical characteristics and performance are essential parts of a good specification. These elements have been kept in mind in the preparation of the many new and revised specifications recently issued.

Substitutes Sought

During World War II the paint manufacturers were busy finding raw-material substitutes for substitutes. It is obvious, therefore, in the preparation of new specifications that consideration be given to the choice of materials in abundant supply, available within our own boundaries, and with a minimum use of those raw materials potentially in shortest supply in case of national emergency.

The establishment of different types of finishes is another way of spreading the load. These elements of consideration, in addition to maintaining a high degree of performance at relatively low cost, have been kept in mind during the research and development work.

The Paint and Chemical Laboratory at Aberdeen Proving Ground, Md., has been pursuing a research and development program since 1946 with a goal of improving the quality of paint and surface-preservation procedures. New and improved raw materials have been evaluated for possible military use and then formulated and compounded into paints.

Many Tests Made

The properties of these paints have been carefully evaluated under stringent laboratory tests. Atmospheric exposure tests literally run into the thousands. Many of the more promising paint systems have been subjected to global exposure ranging from jungle to arctic climates.

Many special studies, such as pigment-to-binder ratios to give maximum performance at the lusterless range of gloss, choice of pigments for color retention, new methods of test, and new methods of chemical analysis had to be made in order to supply the necessary background for the preparation of the procurement specifications.

It was found that certain raw materials had characteristics that specifically lent themselves to meeting military requirements. New raw materials developed and made available only within the past few years have also been utilized. New procedures for application, such as "hot spraying," have been evaluated and adopted.

"Airless atomization" has been investigated and offers much promise, particularly for the coating of cavities, with a money saving in both labor and materials even greater than the "hot-spray" process.

New Specifications

This information has been carefully integrated, and as a result ten new specifications have been issued with but only a few more to come to complete the picture for the present. These new specifications offer military installations as well as manufacturers of ordnance matériel paints of excellent performance formulated to include the best advances presently known to the industry.

Research will be continued in order that the specifications can be kept current to incorporate money savings or increased performance as the paint industry progresses.

Preparing the Surface

Concurrent with the paint developments, studies in metal cleaning and chemical treatment have also progressed with the issuance of improved specifications. Both laboratory and field tests have clearly indicated the absolute necessity for careful cleaning and the desirability of chemical treatment, such as phosphating, prior to painting.

Metal properly prepared prior to painting always results in improved adhesion and marked improvement in durability of the paint and should be considered the first step in proper painting.

Ammunition paints readily qualify as items requiring special military characteristics. The paints should dry rapidly to a firm film permitting high production, and durability should be of a high order under all types of exposure. This durability must be obtained by a single coat of paint at a controlled thickness of 0.9 to 1.1 mils.

Dr. Pickett is chief of the Paint and Chemical Laboratory at Aberdeen Proving Ground, Md. He is a recognized authority on the subject of lacquers and primers for military equipment.

Present Procedure

The present finishing procedure is one coat of enamel or lacquer over a phosphatizing treatment corresponding to Grade I of Specification JAN-C-490.

A styrenated alkyd enamel described by Specification MIL-E-10687 was developed to meet these rigid requirements. The enamel is sufficiently dry to permit handling within ten minutes. Shells given a phosphate treatment in accordance with Grade I of JAN-C-490 and painted with a single coat of MIL-E-10687 enamel were still found to be giving excellent protection after the shells had been lying on the ground for eighteen months at Aberdeen. This type of exposure is considered typical of what might occur in the field.

In order that additional material might be available in case of emergency, a nitrocellulose lacquer described in Specification MIL-L-11195 was also developed. This lacquer was designed for application by the hot-spray process, thereby permitting the same film build-up as enamel in a single application.

The lacquer firms up more rapidly than enamel and is especially useful on heavier-caliber shells or where production lines are such that drying time is limited. It permits slightly faster production and earlier handling of heavier-caliber shells or bombs where slings or clamps might be necessary. The same performance and durability are required with both enamel and lacquer.

New Primer

In addition to the ammunition enamel and lacquer an outstanding lacquer-resisting primer has been developed. This primer described by Specification MIL-P-11414 is particularly useful for ammunition where heavy-caliber shells or bombs are to be stored for long periods of time without benefit of shelter.

This primer is of the nitrocellulose type and is characterized by excellent adhesion to ferrous metals and alumi-

num and magnesium alloys. When phosphatizing large shells or bombs, especially in renovation programs, is not feasible, a coating of wash primer MIL-C-15328 not to exceed 0.2 mil is recommended. This treatment has been found equivalent to Grade I of JAN-C-490 on exposure tests. The MIL-C-15328 treatment should be regarded as a metal treatment and not a substitute for a primer.

Extensive Tests

The Navy Bureau of Ordnance has carried out extensive tests on the products MIL-P-11414, MIL-E-10687, and MIL-L-11195 and is presently considering their use on Navy ammunition. The additional Navy colors will be added to the coördinated specifications MIL-E-10687 and MIL-L-11195. The use of the same specification paints for both Army Ordnance and the Navy Bureau of Ordnance will be a simplification to both the paint supplier and the producer of ammunition.

The painting of tanks presents another problem peculiar to the military. While the use of conventional enamels produces a satisfactory finish from the standpoint of durability, it does slow down production. Because of size and weight, baking of enamel on tanks presents serious problems on space, equipment, and power consumption.

A complete nitrocellulose lacquer system is presently allowed on new tanks. The system consists of a coat of MIL-C-15328 not to exceed 0.2 mil followed by a 0.6- to 0.75-mil coat of MIL-P-11414 inside and out.

The outside is finished with a 0.9- to 1.1-mil coat of hot-spray olive drab lacquer MIL-L-11195. The inside receives a 1.0-mil coat of surfacer MIL-S-10181 followed by a 0.5- to 1.0-mil coat of hot-or-cold-spray white lacquer MIL-L-11195.

Fast Finishing

This type of system permits the complete finishing of a tank within a couple of hours without the necessity of baking or forced drying.

It is considered highly desirable for manufacturers producing components first to treat the parts with Grade I JAN-C-490 or MIL-C-15328 followed by a coat of MIL-P-11414. This prime system will permit the tank producer to finish the paint job after assembly with either an enamel or lacquer depending on the plant layout.

The presently recommended paint system for new automotive equipment is a treatment of Grade I JAN-C-490 followed by a 0.9- to 1.1-mil coat of TT-P-636 followed by a 0.9- to 1.1-mil coat of MIL-E-11857. The possibility of allowing an alternate lacquer system of MIL-P-11414 and MIL-L-11195 is under consideration.

Refinishing of existing equipment is generally carried out with TT-E-00485b, a rust-inhibiting enamel. Equipment for overseas shipment is generally given a coat of lusterless enamel MIL-E-11237 for camouflage purposes.

Much of the new production of staff vehicles, ambulances, and buses is finished in gloss lacquer. This comprises the usual metal treatment followed by MIL-P-11414 primer and a hot-spray olive-drab lacquer MIL-L-12277 or cold-spray lacquer MIL-L-10182. The hot-spray lacquer dries with a sufficiently high gloss so that no buffing or polishing is required.

Two Systems

Two systems of painting have been developed to provide the various Ordnance installations and manufacturers supplying ordnance matériel latitude in finishing schedules. Frequently space, equipment, and power limitations dictate one system or the other.

Under the existing scheme, no sacrifice in speed of production is necessitated because of the painting operations. The quality and durability both of the enamel and lacquer systems have been found equal based upon the results of atmospheric exposure and accelerated tests.

Prior qualification is presently required with the specifications listed on this page before supplying the Government or industrial manufacturers filling Government contracts requiring these specification paints. Qualification is helpful to the paint producer in that he has some assurance that he can produce paint in accordance with the specification requirements.

The Government has evidence that the paint manufacturer understands the specification and has demonstrated his ability to manufacture a satisfactory product. QPL lists are available from the Ordnance district offices for use and guidance of manufacturers of ordnance matériel.

Materials Saved

It is believed that the new and revised paint specifications provide high-quality products in keeping with the best-known commercial practices. The use of critical or strategic materials has been kept to a minimum.

The high quality of the paints has been obtained by careful formulation and not necessarily by the use of expensive ingredients, thereby keeping the cost of the finished paint low.

NEW AND REVISED SPECIFICATIONS

***MIL-E-10687*—a styrenated alkyd lusterless enamel specifically developed for ammunition paints.**

***MIL-E-11237*—an alkyd lusterless enamel superceding U.S.A. 3-173 providing improved durability and more rigid quality control.**

***MIL-E-11857*—an alkyd semi-gloss enamel superceding U.S.A. 3-174 providing improved durability and more rigid quality control.**

***TT-E-00485*—an alkyd semi-gloss rust-inhibiting enamel improved in quality, particularly Type IV, with more rigid control of quality made possible.**

***TT-E-489a (GSA-FSS)*—an alkyd gloss enamel improved in quality and with more rigid control of quality.**

***MIL-P-11414*—a nitrocellulose-type rust-inhibiting primer. This primer is suitable for use with either lacquer or enamel topcoats. Has excellent adhesion to ferrous metals, aluminum, and magnesium.**

***MIL-L-11195*—a nitrocellulose lusterless lacquer specifically designed for hot-spray one-coat application. May be applied cold if hot-spray equipment is not available.**

***MIL-S-10181*—a nitrocellulose-type surfacer, to be used where surfaces are rough and maximum filling is required.**

***MIL-L-10182*—a high-quality automotive-type gloss lacquer which is presently being considered to include a large number of colors and revised to a Federal-specification status.**

***MIL-L-12277*—a high-quality automotive-type gloss lacquer designed for hot-spray application. The gloss is sufficiently high that the customary expensive operations of rubbing and polishing are not required.**

Index of Advertisements

MAY-JUNE, 1953

The following companies have shown by their interest in the Industry-Ordnance Team that they are ready to serve the United States through industrial preparedness for national security and peace. Such companies as these are indicative of the industrial strength of the Nation upon which the military might of the armed forces depends in peace and war. Their production for the peacetime needs of America can be converted to meet national requirements in an emergency.

	Page
Abbott Ball Company	1046
Aerial Products, Inc.	1009
Aetna-Standard Engineering Company	996
Aircraft Marine Products, Inc.	899
Allison Division, GMC	1018
Aluminum Company of America	882
Alvey-Ferguson Company	1042
American Chain & Cable Company	962
American Chemical Paint Company	906
American Locomotive Company	896
American Machine & Foundry Company	1020
American Metaseal Manufacturing Corporation	990
American Wheelabrator & Equipment Corporation	1031
Ampex Electric Corporation	1041
Arma Corporation	IV Cover
Armstrong Cork Company	1042
Arnold Engineering Company	1002
Barnes Company, W. F. and John	1034
Bassick Company	1001
Beaird Company, J. B.	1032
Bell Telephone Laboratories	891
Bendix Aviation Corporation	892, 983, 989, 996
Bendix-Westinghouse Automotive Air Brake Company	991
Bijur Lubricating Corporation	972
Blaw-Knox Company	904
Bowser, Inc.	960
Brainard Steel Division, Sharon Steel Corporation	987
Breeze Corporations, Inc.	982
Brown & Sharpe Manufacturing Company	1046
Buffalo Forge Company	1036
Bundy Tubing Company	885
Burgess-Norton Manufacturing Company	1047
Cannon Electric Company	980
Caterpillar Tractor Company	900
Chase Brass & Copper Company	997
Chrysler Corporation	893, 973
Clark Equipment Company	886
Cleveland Container Company	908
Consolidated Vultee Aircraft Corporation	1030
Continental Motors Corporation	979
Danly Machine Specialties, Inc.	Facing 1009
Dempster Brothers, Inc.	1035
Du Pont de Nemours & Company, E. I.	993
Eastern Tool & Manufacturing Company	1011
Eaton Manufacturing Company	978
Exact Weight Scale Company	1047
Fairchild Engine & Airplane Corporation	1048
Fellows Gear Shaper Company	1045
Ford Instrument Company, Division Sperry Corporation	981
Forney's Inc.	988
Fruehauf Trailer Company	1025
Fuller Brush Company	1046
Gear Grinding Machine Company	1024
General Box Company	969
Geuder, Paeschke & Frey Company	967
Glidden Company	890
Gray Manufacturing Company	888
Great Lakes Steel Corporation	1015
Greenfield Tap and Die Corporation	971
Gulf Oil Corporation	1038
Heckethorn Manufacturing & Supply Company	1019
Heil Company	1043
Hercules Powder Company	998
Herman Company, Edlen	1041
Hydraulic Press Manufacturing Company	985
International Business Machines Corporation	1000
International Nickel Company	1010
Ketay Manufacturing Corporation	1026
King-Seeley Corporation	1043
Kohler Company	1044
Kollmorgen Optical Company	1044
Koppers Company	901
Lapointe Machine Tool Company	883
Leaks Stamping Company	1038
Link-Belt Company	1008
Lurie Engineering Corporation	902
Lycoming Divisions—Avco Manufacturing Corporation	1017
Magnetic Metals Company	907
Markem Machine Company	966
Marmon-Herrington Company	1021
Mason & Hanger Company	1042
McCord Corporation	1041
Metalwash Machinery Corporation	994
Midland Steel Products Company	903
Military Science Book Club	887
Minneapolis-Moline Company	1045
National Malleable & Steel Castings Company	992
National Roll and Foundry Company	1013
National Tube Division, U. S. Steel Corporation	1040
Neilson Chemical Company	1040
New Departure Division, GMC	884
Niagara Blower Company	1043
O & S Bearing & Manufacturing Company	910
Oakite Products, Inc	889
Olin Industries, Inc.	1039
Oliver Corporation	911
Parker Rust Proof Company	1037
Peabody Engineering Corporation	968
Perfection Stove Company	1006
Pioneer Engineering & Manufacturing Company	907
Pittsburgh Plate Glass Company	975
Pratt & Whitney Division, Niles-Bement-Pond Company	1022
Precision Castings Company	905
Pressed Steel Car Company	1012
Remington Arms Company	964, 1044
Remington Rand Inc.	1033
Reo Motors, Inc.	1014
Rheem Manufacturing Company	977
Rhodes Company, M. H.	992
Riverside Foundry	961
Rockwell Manufacturing Company	994
Rolock, Inc.	986
Shafer Bearing Corporation	974
Sheffield Corporation	897
Sperry Gyroscope Company	1064
Spicer Manufacturing Division, Dana Corporation	Facing 976, 977
Standard Steel Spring Company	894
Standard Tube Company	970
Steel Products Engineering Company	898
Stewart-Warner Corporation	963
Strom Steel Ball Company	984
Surface Combustion Corporation	1004
Timken-Detroit Axle Company	1005
Timken Roller Bearing Company	III Cover
Triplex Industries, Inc.	II Cover
Tube Reducing Corporation	909
Tung-Sol Electric, Inc.	1038
Underwood Corporation	976
United Can Company	1040
United Engineering and Foundry Company	Facing 1008
Waldes Kohinoor, Inc.	995
Watson-Stillman Company	1003
Wilson Contracting Company, Lee	965
Wirebound Box Manufacturers Association	1016
Wollensak Optical Company	1037
Wolverine Tube Division, Calumet & Hecla, Inc.	1027

ORDNANCE *is set up, printed, and bound for the American Ordnance Association by the William Byrd Press, Inc., Richmond, Va.*

When Zero equals Five

Yes—it's a fact—the Sperry Zero Reader* Flight Director combines information supplied by *five* basic instruments...the gyro-horizon, directional gyro, magnetic compass, sensitive altimeter, and cross-pointer meter . . . for simplified manual control of aircraft.

Widely specified for military, passenger, and executive planes, the Flight Director reduces pilot fatigue during en route flying. It combines the necessary information on a simple two-element indicator and directs the pilot how to move the controls to maintain altitude and heading with ease. This simplified director presentation . . . where the pilot flies "zero" . . . is always used in the same manner, whether for leisurely cruising or for making landing approaches under rough conditions.

The Flight Director was developed by Sperry with the cooperation and encouragement of the All-Weather Flying Division, USAF, and the Air Transport Association. Its drama starts more than forty years ago with Sperry's first research in gyroscopic flight. And the end of such research and development will never be in sight. For Sperry's program is *continuous*. As it works for today, it pioneers for tomorrow, meeting and solving such complex problems as are presented in the fields of jet aircraft and guided missiles.

*T. M. REG. U. S. PAT. OFF.

SPERRY GYROSCOPE COMPANY
DIVISION OF THE SPERRY CORPORATION

GREAT NECK, NEW YORK • CLEVELAND • NEW ORLEANS • BROOKLYN • LOS ANGELES • SEATTLE • SAN FRANCISCO
IN CANADA • SPERRY GYROSCOPE COMPANY OF CANADA, LIMITED, MONTREAL, QUEBEC

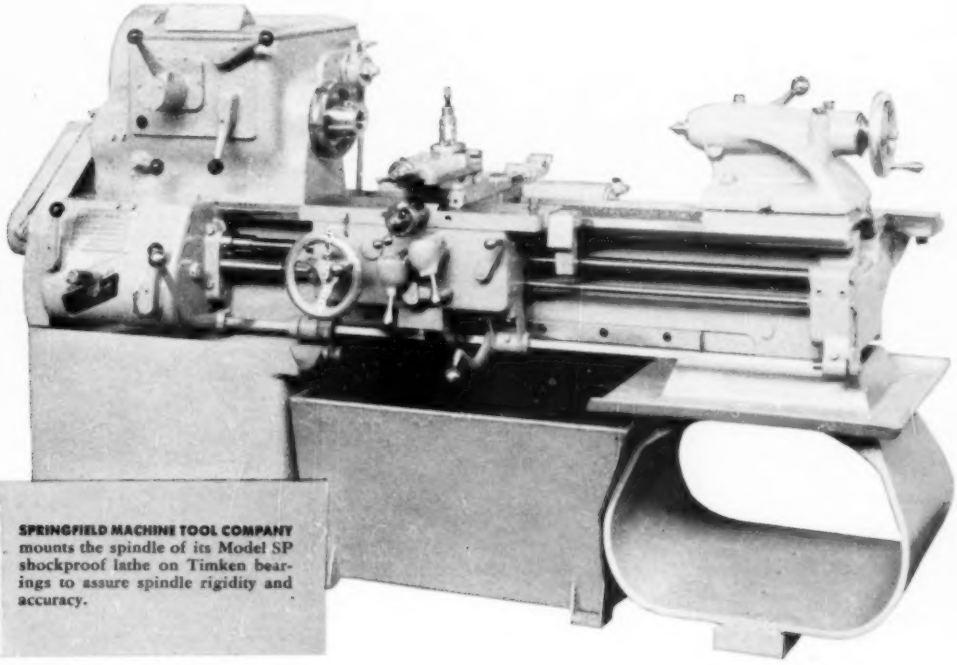
Sea-going lathe has sea legs for steadiness ...TIMKEN® bearings for precision

THIS new Springfield shockproof lathe is especially designed for high precision machine work while bolted to the deck of a naval vessel at sea. It has a radically different structure and special "sea legs" that prevent it from weaving when the deck flexes and enables the machine to withstand the severe shock of near misses and other combat-incurred stresses. Spindle rigidity and accuracy, essential for high precision work on land or sea, is maintained with Timken® precision tapered roller bearings.

Timken precision bearings are especially designed for spindle applications. Run-out tolerances can be held to a maximum of 75 millionths of an inch. The tapered design of Timken precision bearings enables them to take both radial and thrust loads in any combination, holds spindles rigid and permits pre-loading to any desired degree to prevent chatter. Tapered design also makes Timken precision bearings easy and less costly to assemble (bench assembly is possible), and eliminates the need for special thrust bearings.

For the past 25 years, Timken precision bearings have been an important factor in the development of precision machine tools. Next time you buy or build a machine tool, be sure it's equipped with Timken precision tapered roller bearings. Always look for the trade-mark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian Plant: St. Thomas, Ont. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



SPRINGFIELD MACHINE TOOL COMPANY mounts the spindle of its Model SP shockproof lathe on Timken bearings to assure spindle rigidity and accuracy.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

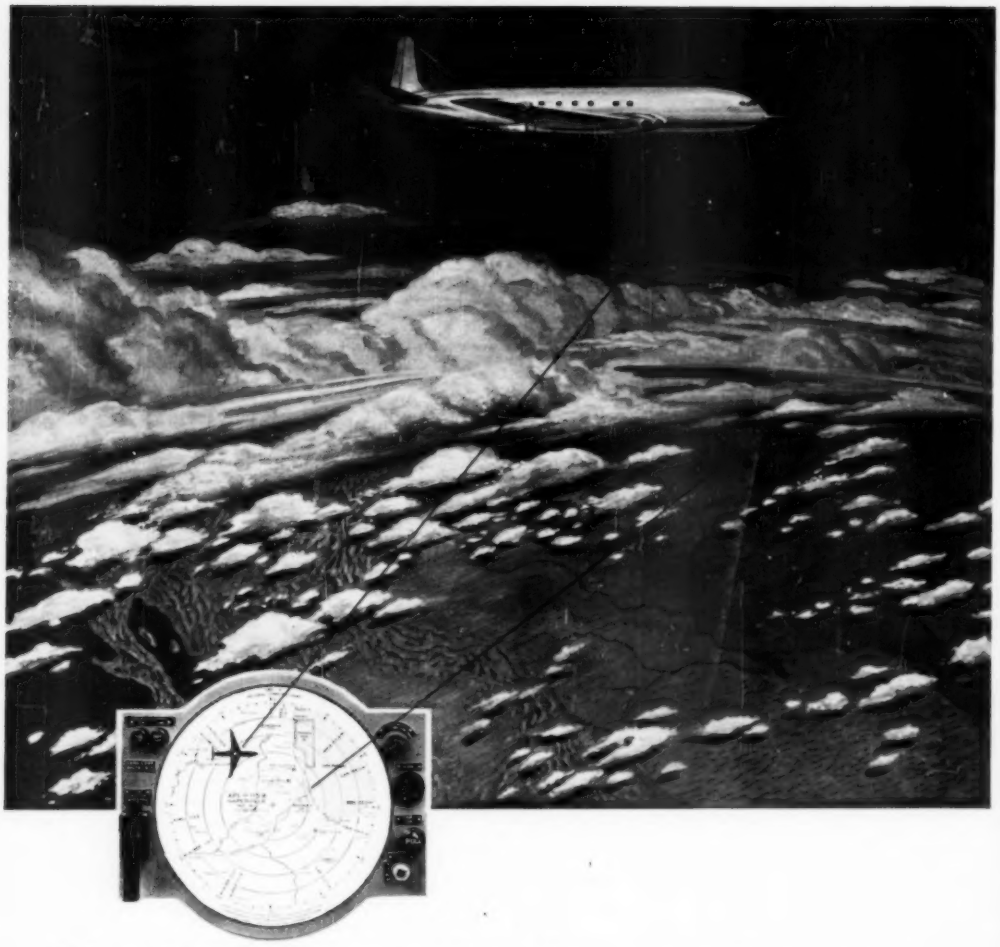
TAPERED ROLLER BEARINGS

DESIGN LEADERSHIP

The first Timken tapered roller bearing was produced in 1898. Since then the one-piece multiple perforated cage, wide area contact between roller ends and ribs, and every other important tapered roller bearing improvement have been introduced by The Timken Roller Bearing Company.

The Timken Company leads in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ↓ AND THRUST →◎← LOADS OR ANY COMBINATION →◎←



Now! Arma puts the plane on the map...

Arma's new Pictorial Computer shows a pilot his exact location and heading, continuously on a projected map—throughout a given flight. Here's how it works:

A film strip containing as many as 700 maps shows the various OBD stations over which the aircraft will pass. During flight, the Arma Computer automatically indicates position and heading of the plane on a TV-like screen. In other words, the Computer shows continuously and exactly where the plane is in respect to the ground, at every moment of flight—regardless of weather, altitude or speed. It automatically tunes to the appropriate OBD frequency, automatically adjusts for scale of map and has provisions for automatic chart changing.

Arma has worked closely with the Air Navigation Development Board and the Civil Aeronautics Administration in developing this Pictorial Computer for use in proposed advanced systems of air navigation and traffic control. For 35 years Arma has worked hand in hand with the Army, Navy and Air Force—and more recently with the Atomic Energy Commission—in developing important military control systems. *Arma Corporation, Brooklyn, N. Y.; Garden City, N. Y. Subsidiary of American Bosch Corporation.*

ARMA ADVANCED ELECTRONICS FOR CONTROL